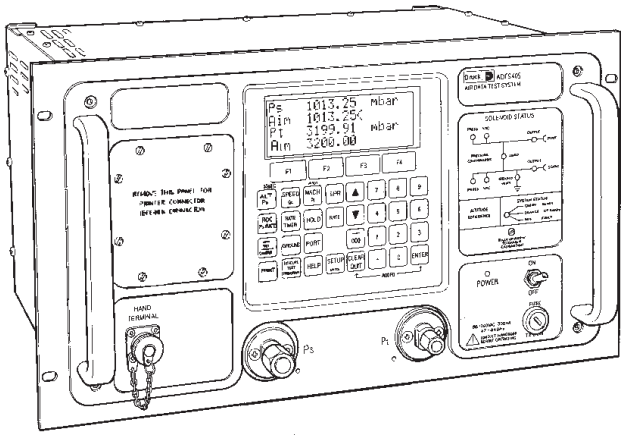
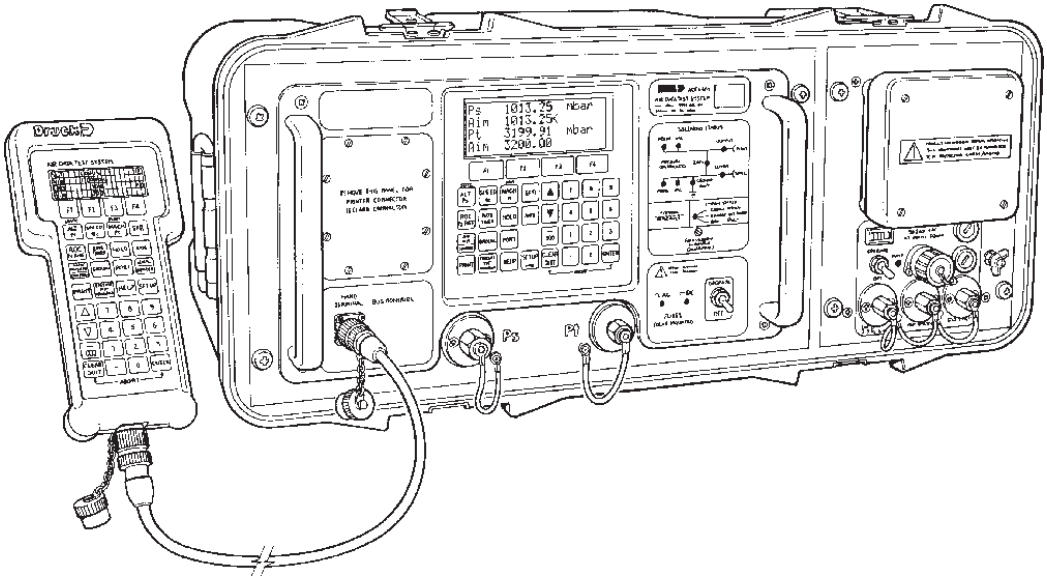
GE
Sensing & Inspection Technologies

Druck ADTS 405/405F

Air Data Test Systems

Service Manual K0171





© 2008 General Electric Company. All rights reserved.

TABLE OF CONTENTS

Preliminary pages

Table of contents (this table)
Introduction
Purpose
Scope
Glossary
Abbreviations

Chapter

1 DESCRIPTION

2 DISMANTLING

3 ASSEMBLING

4 TESTING

5 CALIBRATION

6 ILLUSTRATED PARTS LIST

INTRODUCTION

Purpose

This technical manual provides servicing instructions and a parts list to an intermediate level of maintenance for the Druck ADTS 405 series of air data test systems.

Scope

This technical manual contains a constructional description, a functional description explaining the theory of operation, dismantling, assembling and testing procedures. The test equipment and special tools required for the recommended maintenance level are listed.

Associated Druck Documents:

K114 - ADTS 405 User Manual

GLOSSARY

Terminology

The terminology used in this manual is specific and individual interpretation must not be introduced. The terms are defined as follows:

Adjust:

To bring to a more satisfactory state; to manipulate controls, levers, linkages, etc. to return equipment from an out-of-tolerance condition to an in-tolerance condition.

Align:

To bring into line; to line up; to bring into precise adjustment, correct relative position or coincidence.

Assemble:

To fit and secure together the several parts of; to make or form by combining parts.

Calibrate:

To determine accuracy, deviation or variation by special measurement or by comparison with a standard.

Check:

Make a comparison of a measure of time, pressure, temperature, resistance, dimension or other quality with a known figure for that measurement.

Disconnect:

To detach the connection between; to separate keyed or matched equipment parts.

Dismantle:

To take apart to the level of the next smaller unit or down to all removable parts.

Ensure:

To confirm that a proper condition exists; to find out with certainty.

Examine:

To perform a critical visual observation or check for specific conditions; to test the condition of.

Fit:

Correctly attach one item to another.

Inspect:

Review the work carried out by Specialists to ensure it has been performed satisfactorily.

Install:

To perform operations necessary to properly fit an equipment unit into the next larger assembly or system.

Maintain:

To hold or keep in any particular state or condition especially in a state of efficiency or validity.

Operate:

Ensure that an item or system functions correctly as far as possible without the use of test equipment or reference to measurement.

Readjust:

To adjust again; to move back to a specified condition; to bring back to an in-tolerance condition.

Reconnect:

To rejoin or refasten that which has been separated.

Refit:

Fit an item which has previously been removed.

Terminology (continued)

Remove:

To perform operations necessary to take an equipment unit out of the next larger assembly or system. To take off or eliminate. To take or move away.

Repair:

To restore damaged, worn out or malfunctioning equipment to a serviceable, usable or operable condition.

Replace:

Remove an item and fit a new or a serviced item.

Reset:

To put back into a desired position, adjustment or condition.

Service:

To perform such operations as cleaning, lubricating and replenishing to prepare for use.

Test:

Ascertain by using the appropriate test equipment that a component or system functions correctly.

Abbreviations

The following abbreviations are used in this manual; the abbreviations are the same in the singular and plural.

A	Ampere
abs	Absolute
a.c.	Alternating current
ALT	Altitude
CAS	Calibrated airspeed
d.c.	Direct current
e.g.	For example
EOC	End of conversion
EPR	Engine pressure ratio
EPROM	Electrically programmable read only memory
etc.	And so on
Fig.	Figure
ft	Foot
g	Gauge
Hg	Mercury
Hz	Hertz
IAS	Indicated airspeed
i.e.	That is
IEEE 488	Institute of Electrical and Electronic Engineers standard 488 data
in	Inch
kg	Kilogram
LED	Light emitting diode
(M)	Magnesium alloy
m	Metre
mA	Milliampere
max	Maximum
mbar	Millibar
min	Minute or minimum
mm	Millimetre
mV	Millivolts
No.	Number
N.m.	Newton metre
Para.	Paragraph
Ps	Static pressure
psi	Pounds per square inch
Pt	Total pressure
Qc	Differential pressure Ps/Pt
QFE	Local atmospheric pressure
QNH	Barometric pressure at sea level
ROC	Rate of climb
SCPI	Standard commands for programmable instruments
TAS	True airspeed
TE	Test equipment
V	Volts
Vc	Calibrated velocity
Vt	True velocity
+ve	Positive
-ve	Negative
°C	Degrees Celsius

Chapter 1

Description

CONTENTS

	Para.
Introduction	1
SPECIFICATION	
DESCRIPTION	
ADTS 405 and Electronics Rack (ADTS 405F)	5
Pitot and Static Controllers	11
Operation	14
Pressure output	19
Soft start	21
Control computer and communications	22
ARINC 429 Interface (special order)	23
Altimeter Encoder Interface (special order)	24
IEEE 488 Interface (option E)	25
Pump Rack	26
Hand terminal	31

Illustrations

	fig.
ADTS 405 General view	1-1
ADTS 405F General view	1-2
ADTS 405	1-3
ADTS 405F Racks	1-4
ADTS 405 and Electronics Rack Internal view	1-5
Controller PCB Schematic	1-6
Ps Manifold Schematic	1-7
Pt Manifold Schematic	1-8
Supervisor Computer and Communications	1-9
Pump Rack	1-10
Hand terminal	1-11

INTRODUCTION

1. There are two versions of the ADTS 405 a 19", 6U high (10½") rack-mounted unit and a flight line unit. The ADTS 405 is a rack-mounted system and, with external pressure and vacuum supplies connected, provides measurement and control for sense and leak testing and functional tests of air data instruments, components and systems. The ADTS 405F is a self-contained air data test system providing complete pressure and vacuum measuring and control for on-aircraft sense and leak testing and functional tests of air data instruments, components and systems. The unit comprises an electronics rack and pump rack enclosed in a high density, polyethylene case.

2. The user interface for the rack-mounted version is a front panel keyboard and display with a hand terminal as an option. For the ADTS 405F version the hand terminal is the supplied user interface with the front panel keypad and display as an option. The ADTS 405 can also be controlled by a computer (PC) using the front or rear panel IEEE 488 communications interface. The front panel contains the operate switch and the mimic panel with LED indicators showing the operation of the two pneumatic channels.

3. The pump rack, on the ADTS 405F, produces pressure and vacuum supplies for the electronics rack and for external connectors. Located on the front panel, the external connectors provide for external pressure and vacuum supplies (EXT PRESSURE and EXT VACUUM) and an auxiliary static (vacuum) output (AUX). The auxiliary static output provides vacuum for suction-type static adaptors. The rack is cooled by a fan located under a protective cover on the front panel. The power supply connection for the ADTS 405F is located on the front panel.

4. The ADTS 405 can display and operate in either units of pressure measurement or aeronautical units. The rate that the pressure changes to a new set-point can be set. The rate is then reduced as the set-point is achieved and maintained, without overshoot. A `ground' facility automatically and safely controls both channels to atmospheric pressure at the previously entered rates of change and then informs the user when both channels are safely at `ground'.

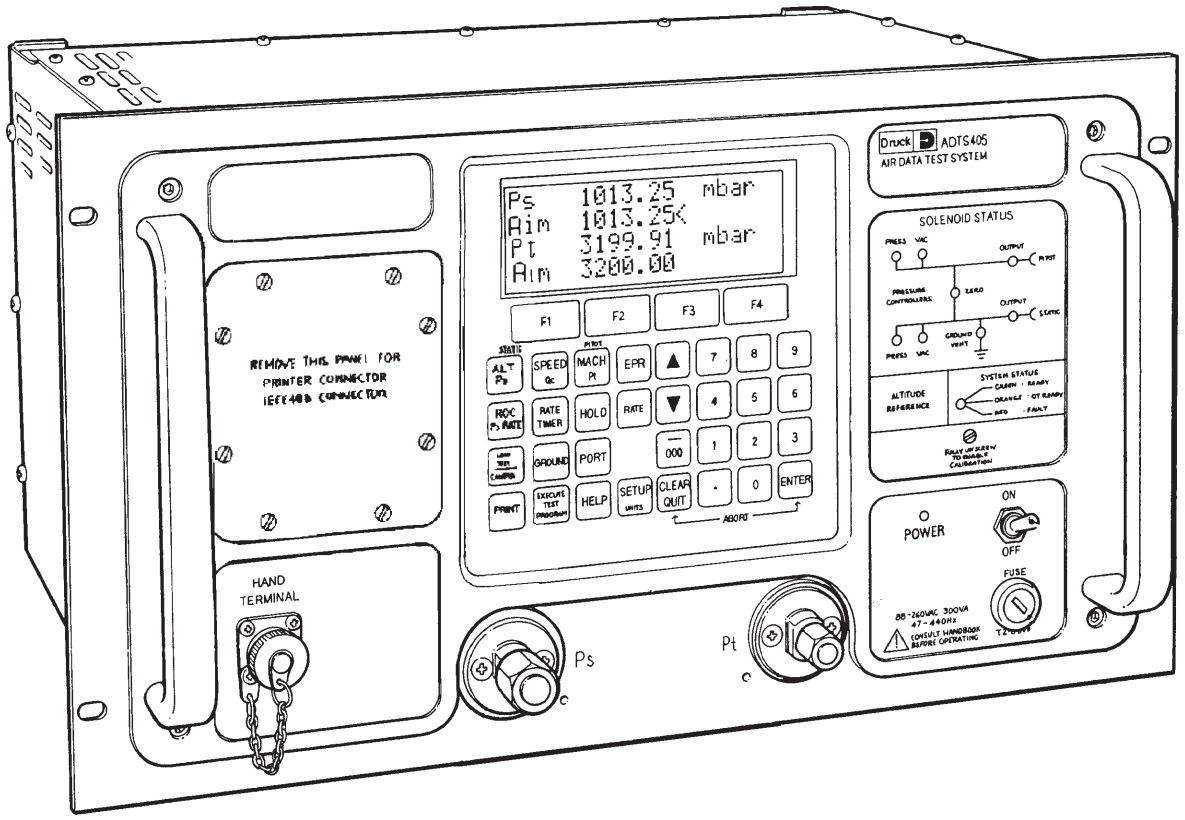


Figure 1-1 General view

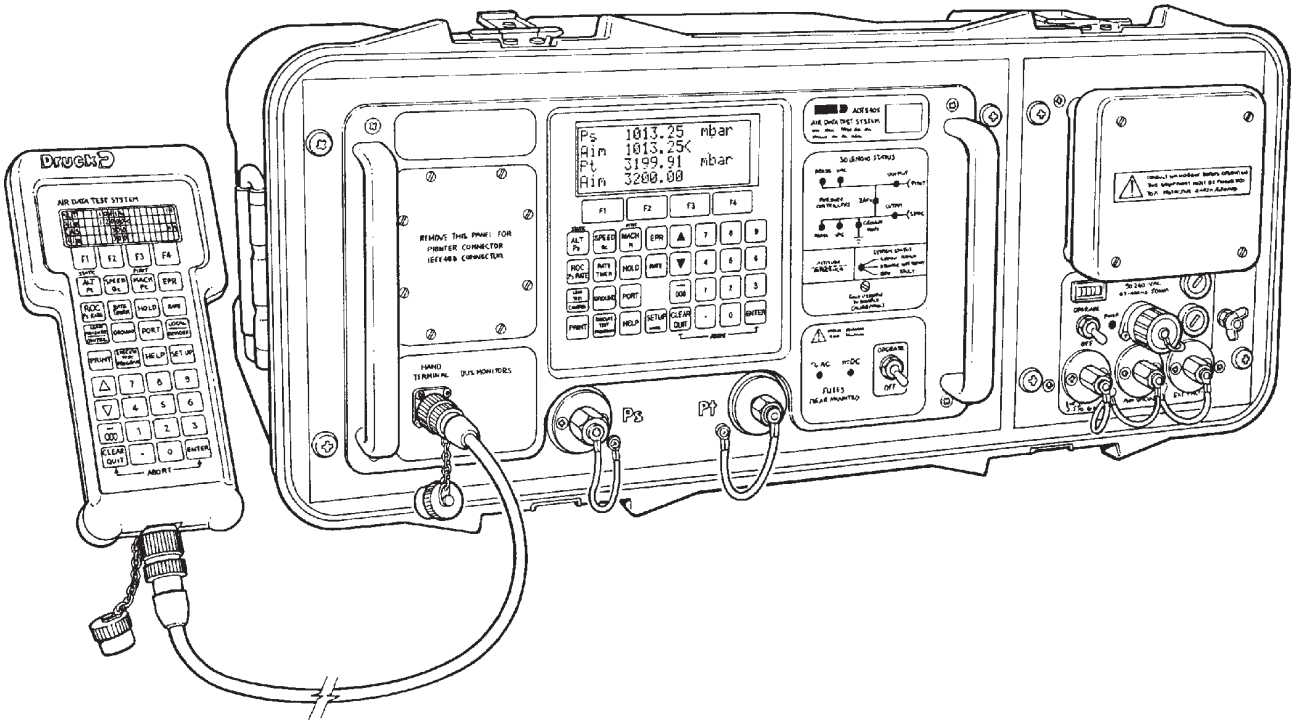
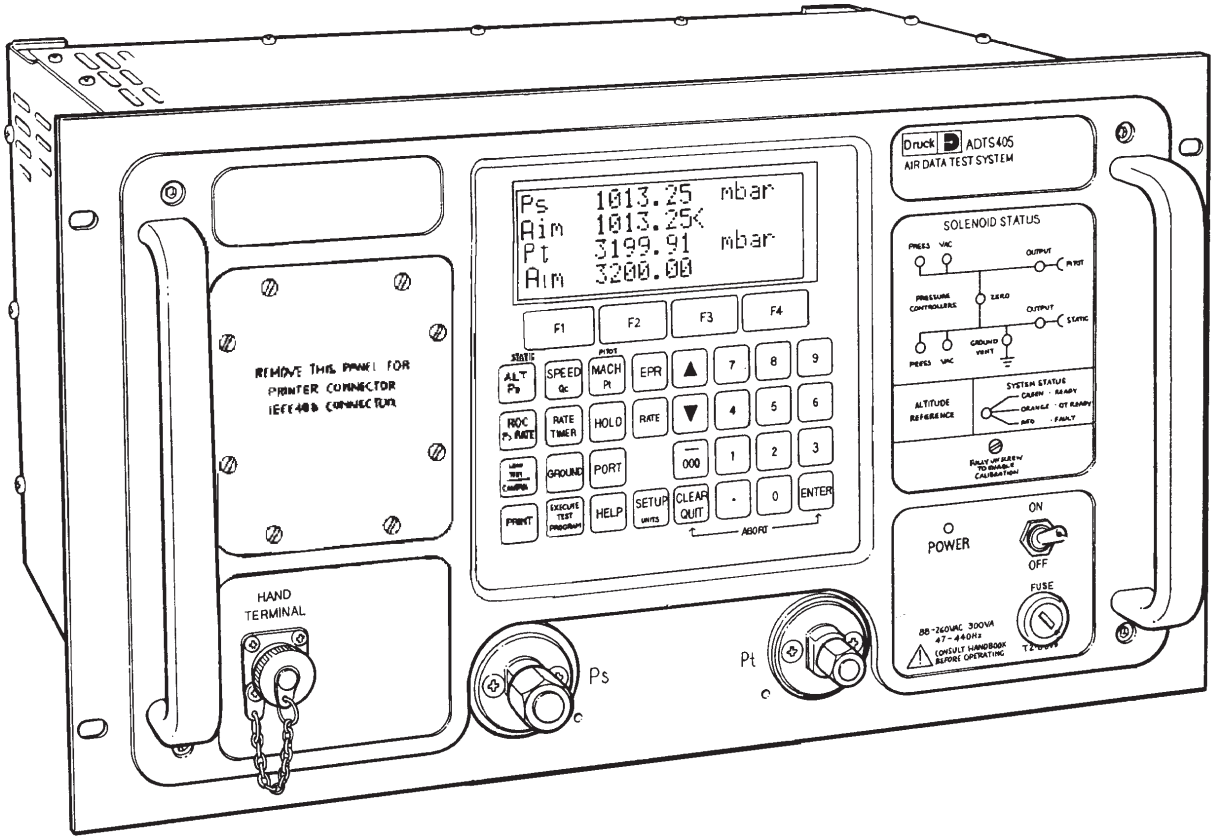


Figure 1-2 General view

SPECIFICATION

Electrical power supply ..... 88 to 260V a.c.
..... 47 to 440Hz
ADTS 405 ..... 200 VA maximum
ADTS 405F ..... 500VA maximum
Pneumatic outputs
Altitude range ..... -2000ft to +80000ft
Altitude accuracy
Sea level ..... ± 5ft
30,000ft ..... ± 7ft
60,000ft ..... ± 25ft
Static
range ..... 1355 to 35 mbar abs
accuracy ..... ± 0,012% reading
..... 0.008% FS
Airspeed ranges
civil ..... 0 to 500 knots
military ..... 0 to 850 knots
special ..... 0 to 1000 knots
Airspeed accuracy
50 knots ..... ± 0,5 knots
500 knots ..... ± 0,07 knots
Qc
range ..... 35 to 2700 mbar abs
accuracy ..... ± 0,015% reading
..... 0.007% FS
Special
range ..... 35 to 3500 mbar abs
accuracy ..... ± 0,015% reading
..... 0.007% FS
Mach number
civil ..... 0 to 1,00
military ..... 0 to 6,00
Accuracy ..... Better than 0,005
Rate of climb
Generated ranges
civil ..... 0 to 6000 ft/min
military ..... 0 to 15000 ft/min
Accuracy ..... ±1% of value
Dimensions
ADTS 405 ..... 485 mm x 270 mm x 305 mm
Weight ..... 12 kg
ADTS 405F ..... 442 mm x 755 mm x 332 mm
Weight ..... 29 kg
Temperature
Operating ..... 10° to +50°C
Calibrated ..... 5° to +35°C
Storage ..... -40° to +70°C

Note: The rates, ranges and limits may be different depending on customer requirements.



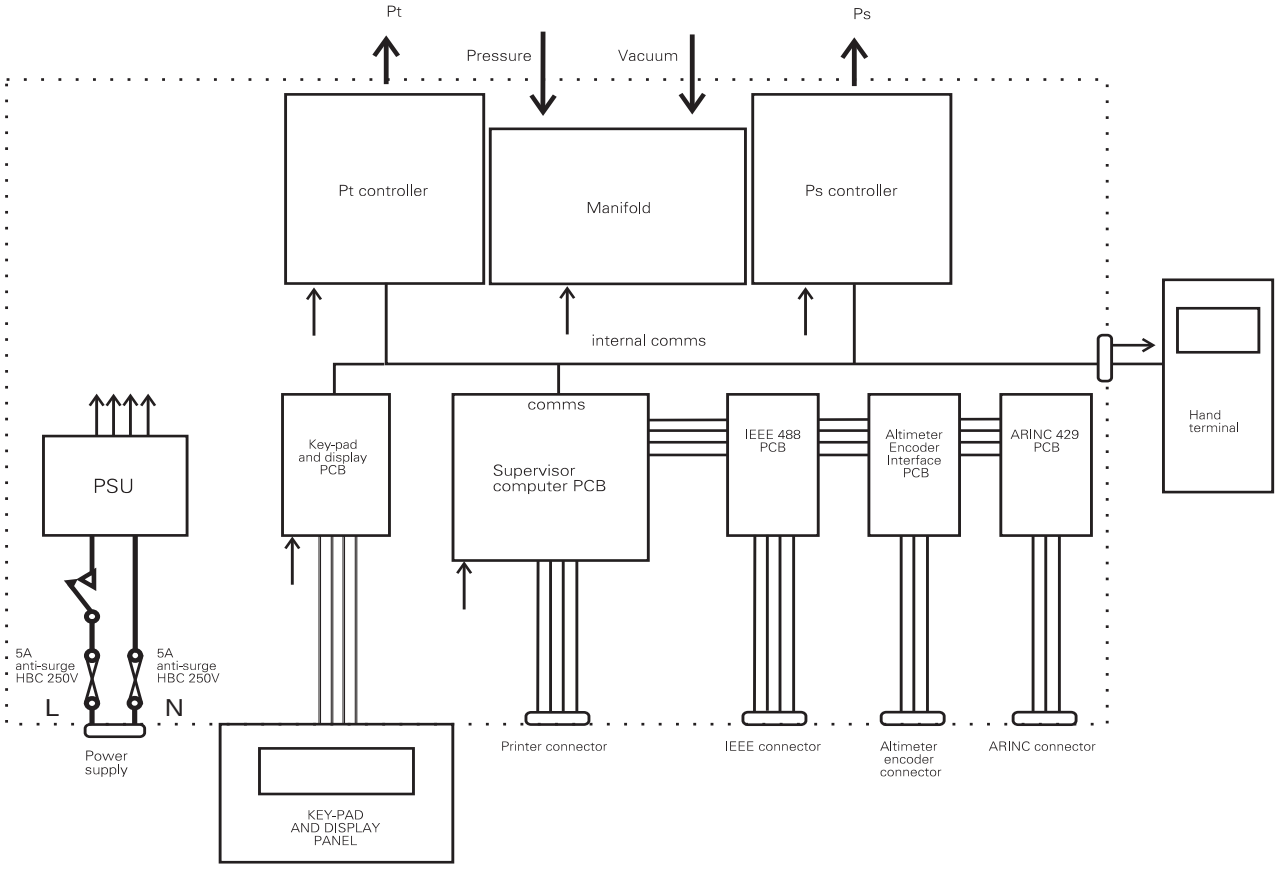


Figure 1-3 ADTS 405

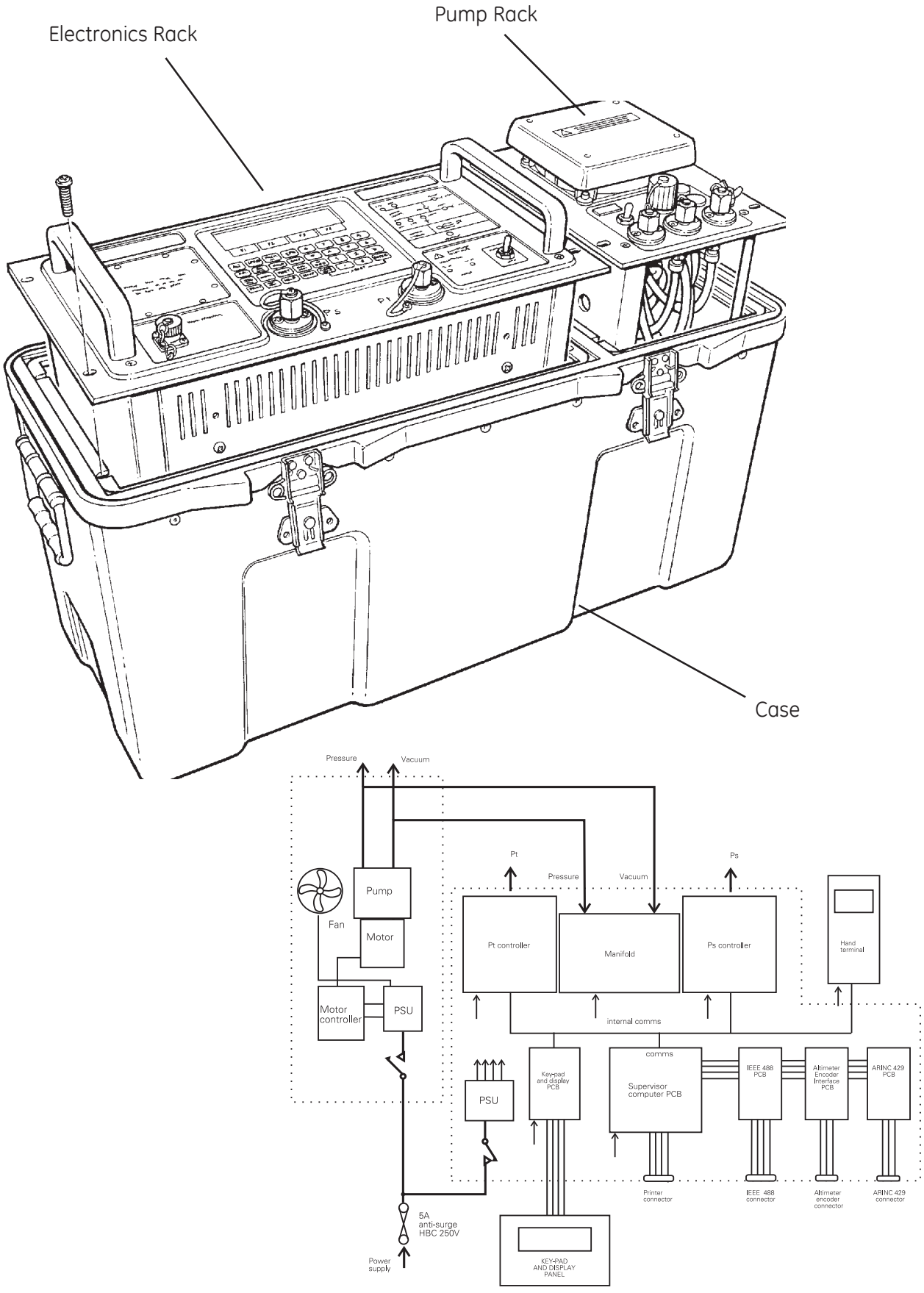


Figure 1-4 ADTS 405F Racks

Description

ADTS 405 and Electronics rack (ADTS 405F)

5. The unit contains the pitot and static manifolds, together with all appropriate solenoid valves, pressure transducers and pneumatic output connectors. Also located in this rack are the controller PCB for each channel, computer PCB, IEEE 488 PCB key-pad and display PCB, ARINC 429 PCB and a power supply unit.

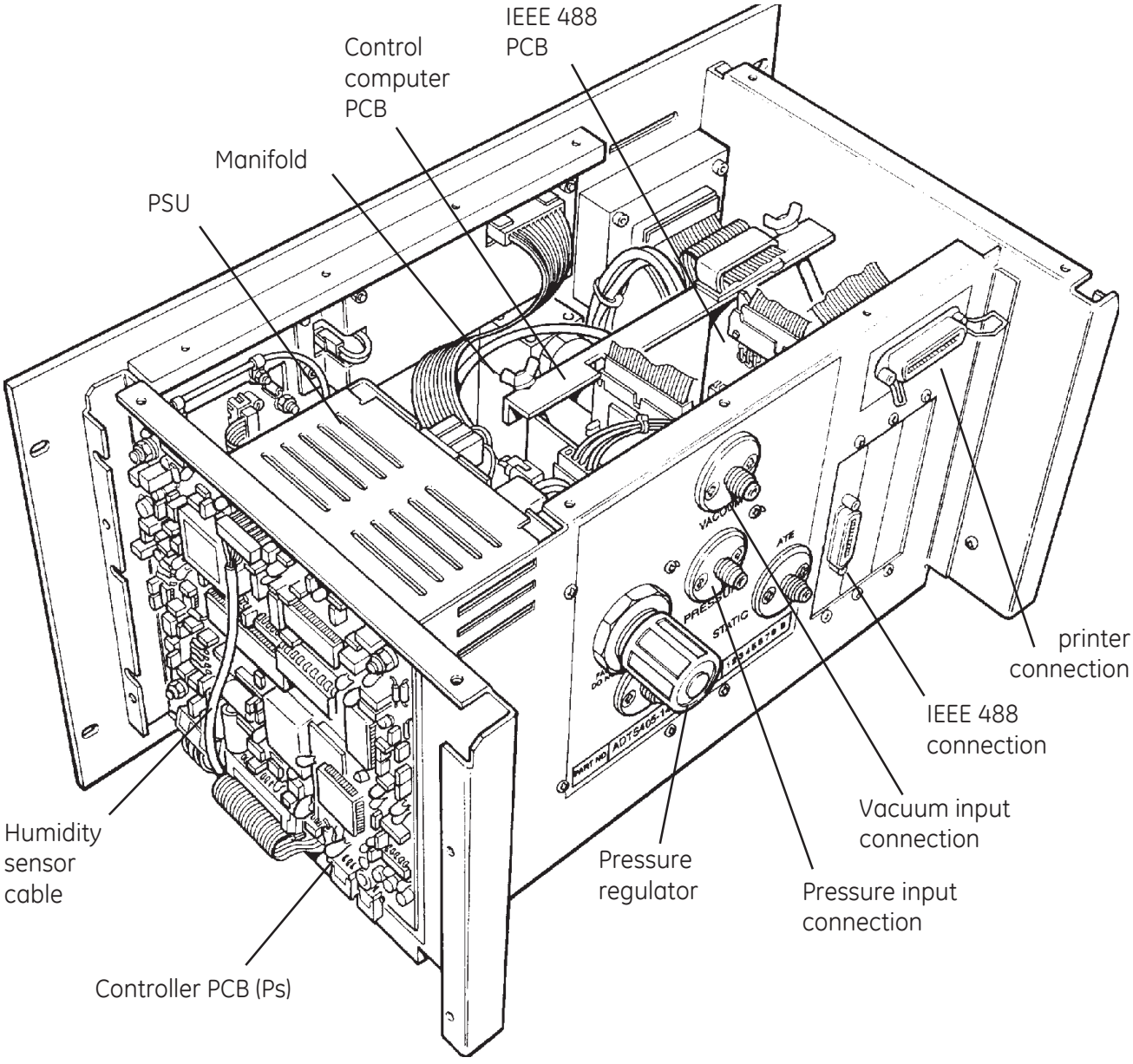


Figure 1-5 ADTS 405 and Electronics rack Internal view

Power supply

6. The power supply unit is located in the electronics rack enclosed in a metal casing. Output from the PSU supplies the rack with a nominal +5V and ±15V and a semi-regulated 24V supply (regulated with respect to +5V supply). The circuit automatically resets after an interruption caused by a power failure.

Solenoid valves

7. All solenoid valves are of a similar type, spring-loaded to the de-energised condition. When energised, the plunger moves against spring pressure to operate the valve. The principal valves are the apply and release solenoids, these operate alternately to connect the manifold either to the pressure or the vacuum connection from the pump generating and then holding the required pressure in the manifold. The relative opening times of the two valves are determined by the error signal in the controller PCB, thereby ensuring that the pressure in each manifold reaches an equilibrium at the pressures appropriate to the altitude, speed, rate of climb or engine intake condition demanded at the hand terminal. The valves also equalise air pressure to give a zero reading during a self-test routine when the test system is isolated from the aircraft air data systems. Both channels have protection valves controlled by the microcomputer, when energised the valves close isolating the test system from the aircraft system.

8. The humidity sensors measure the humidity of the air for each manifold producing a voltage signal proportional to the humidity. The voltage is amplified and corrected using stored calibration data held in each controller circuit. The resulting voltage is used to correct the signal from the vibrating cylinder pressure transducer.

9. The pressure input line is fitted with a filter and a 9 bar pressure regulator before it feeds the manifold assembly. The vacuum input line also has a filter.

10. The principal components of the manifold assembly are two pneumatic manifolds (one for pitot connection, one for static), together with their associated solenoids, pressure sensing transducers. These components are mounted on the inside of the rack and are not accessible when the rack is installed.

Pitot and Static Controllers

11. The controller PCB is a self-contained pressure measurement control system which takes the analogue set-point from the data converter and compares it with the voltage from the transducer. A difference (error) is used to generate the pulse width modulated drive voltages for the 'apply' and 'release' solenoid valves which determine the pressure in the manifolds. Both controllers operate in a similar way with additional configuration held in EEPROM.

12. The controllers receive pressure and pressure rate commands over the internal communications ring and convert them into controlled pressure and pressure rates at the output using the rough vacuum and pressure supplied by the pump unit. They accurately measure the pressure and pressure rate at the output and transmit it over the communications ring the control computer.

13. Other commands can be used to open and close auxiliary solenoid valves, switch the controller on and off (measure mode), hold the changing control pressure and oscillate around the set-point. Any errors detected during internal self-test and during normal operations will be coded and transmitted on the internal communications ring.

Operation

14. If the controller is on, a pressure and pressure rate demand received is processed by the microcomputer and output via the set-point generator (digital to analogue convertor) as an analogue voltage which forms the inner loop set-point. The inner loop is a high bandwidth analogue closed loop pressure control system. The inner loop maintains a pressure in the manifold which at all times closely follows the inner loop set-point.

Inner loop

15. The pressure in the manifold is measured by the control transducer which is a silicon strain-gauge pressure transducer giving a voltage output proportional to the pressure applied. This voltage is amplified by the signal conditioning circuits, given further gain depending on the mode of operation by the gain switching circuits and then subtracted from the inner loop set-point and amplified in the error amplifier. The resulting error signal is frequency compensated to keep the inner control loop stable, then applied to a pulse generator circuit that produces a pulse width modulated output, through a power driver circuit, to both the vacuum and pressure solenoids.

Outer loop

16. As the pressure changes in the manifold the pressure approaches the set-point the outer loop starts operating. The pressure in the manifold is first measured by the main transducer. This is a vibrating cylinder pressure transducer producing a high stability, high accuracy frequency (square wave) proportional to pressure and an analogue voltage proportional to temperature.

17. The pressure signal feeds a 24 bit period counter which counts a 20 MHz reference oscillator for a number of cycles of the incoming square wave representing pressure. This enables the incoming square wave to be measured to a very high resolution by the microcomputer. The microcomputer software uses the pressure and temperature data to calculate the exact pressure being applied to the main transducer. Further corrections are made by the microcomputer using the stored zero and span constants from the controller module and the stored constants for the humidity sensor.

18. The resulting accurate pressure reading is amplified and frequency compensated by the microcomputer and, after subtracting the entered aim point, the resulting value is sent to the set-point generator (DAC) to generate the inner loop set-point. This causes the manifold pressure to change until the pressure measured by the main transducer is exactly the same as the pressure demand sent by the hand terminal.

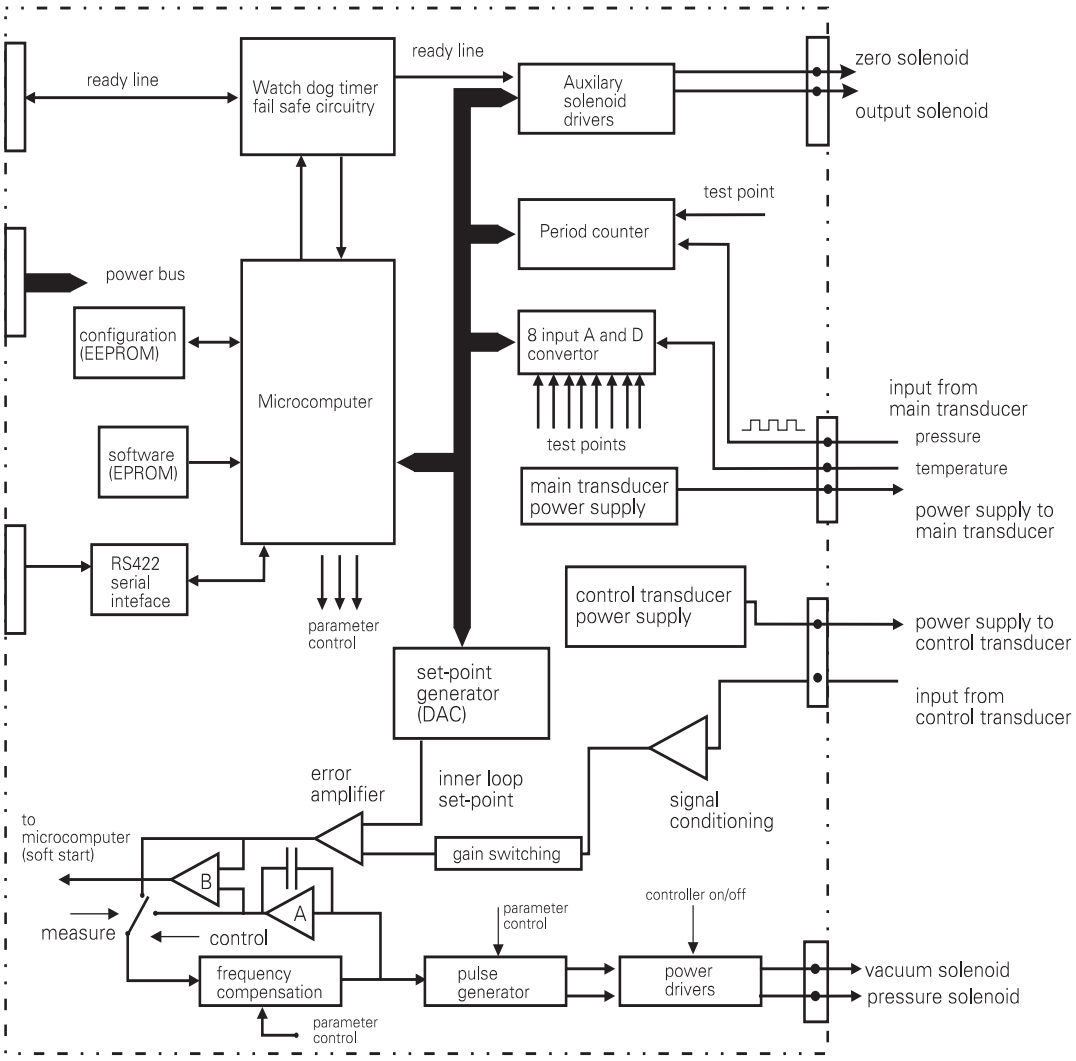


Figure 1-6 Controller PCB Schematic

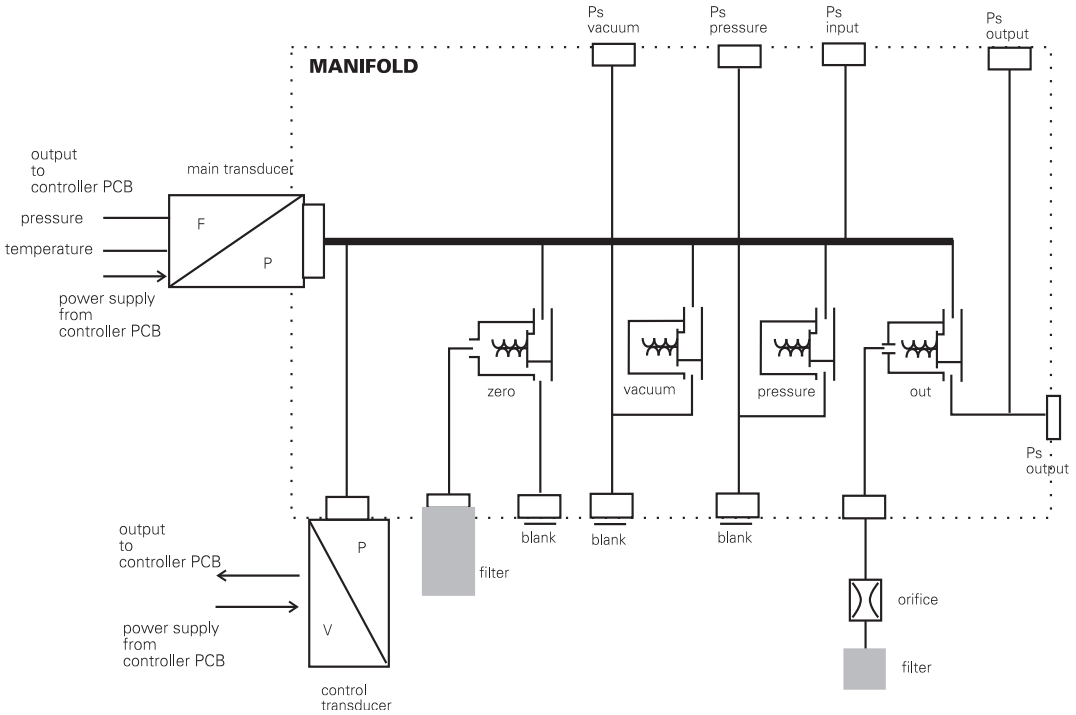


Figure 1-7 Ps Manifold Schematic

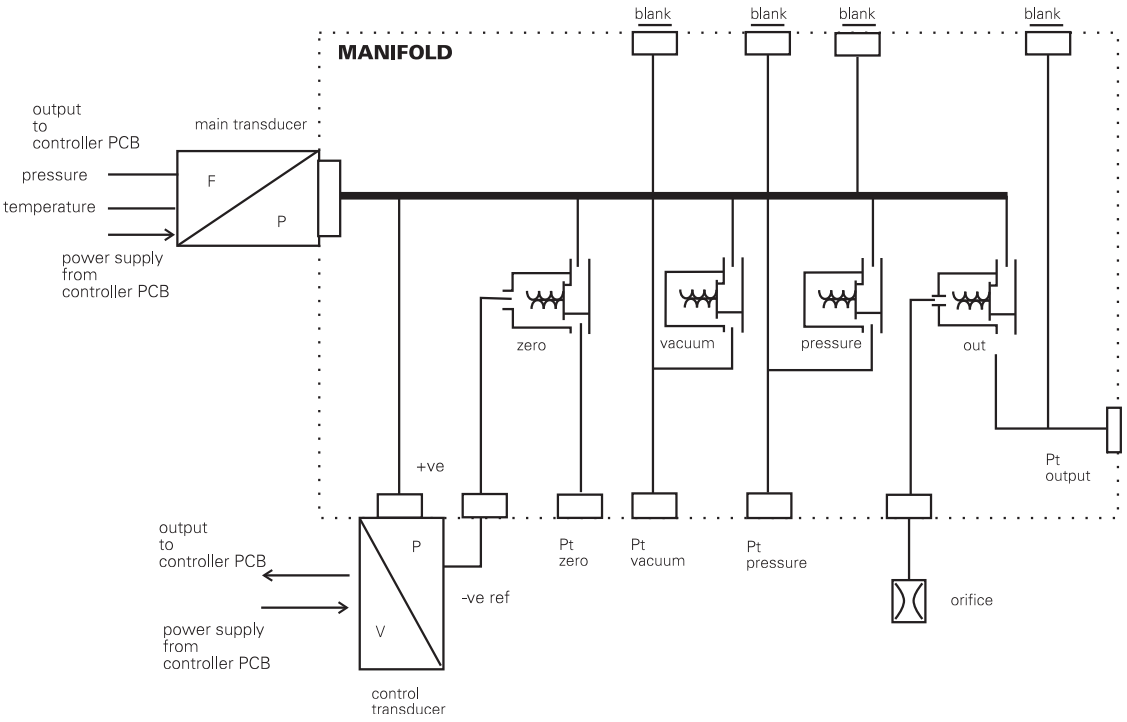


Figure 1-8 Pt Controller PCB Schematic

Pressure output

19. The pressure generated in the manifold can be applied to the aircraft system by opening the output solenoid. The command to open the output solenoid is received over the internal communication ring. A signal is sent to the auxiliary drivers but the output solenoid will only open if the ready line is active.

Ready line

20. The ready line must be in an active state to enable the auxiliary solenoid driver circuits. The ready line is deactivated by an interruption of this line or by a fault detected by the watchdog timer and fail safe circuitry. Under fault conditions the output valve instantly closes isolating the output from the aircraft systems.

Soft start (Fig 1-7)

21. This provides an almost instantaneous transition from measure mode to control mode. When the controller is off the switch is in the measure position, connecting amplifier A across the input and output of the frequency compensation circuit. The output of the frequency compensation circuit is forced to zero ensuring that no pulses will be applied to the pressure and vacuum valves when the controller is switched on. When the controller is selected on, the set-point generator is adjusted until the voltage at the output of the error amplifier is the same as the voltage applied to the frequency compensation circuit by amplifier A. With equal voltage applied, the switch changes from measure to control, disconnecting amplifier A and, amplifier B initiates the soft start signal to microcomputer which switches on the controller. The value of the set-point is sent back to the microcomputer where it is converted to current units of display and used as the current aim value. It takes less than 2 seconds for the controller to come on-line.

Supervisor Computer and Communications

22. The supervisor computer consists of the computer PCB located on a motherboard. The computer PCB is a self-contained microcomputer based on the 68000 microprocessor. The software is contained in two EPROM located on the computer PCB. The computer PCB provides direct communication with the hand terminal and an internal communications ring in the form of RS422 differential drivers and receivers. It also provides a direct interface for the Centronics parallel printer output connector on the front panel.
The motherboard distributes the data, address and control bus to the control computer. It also contains a ready line interface and EEPROM for storing system configuration information and test program sequences.

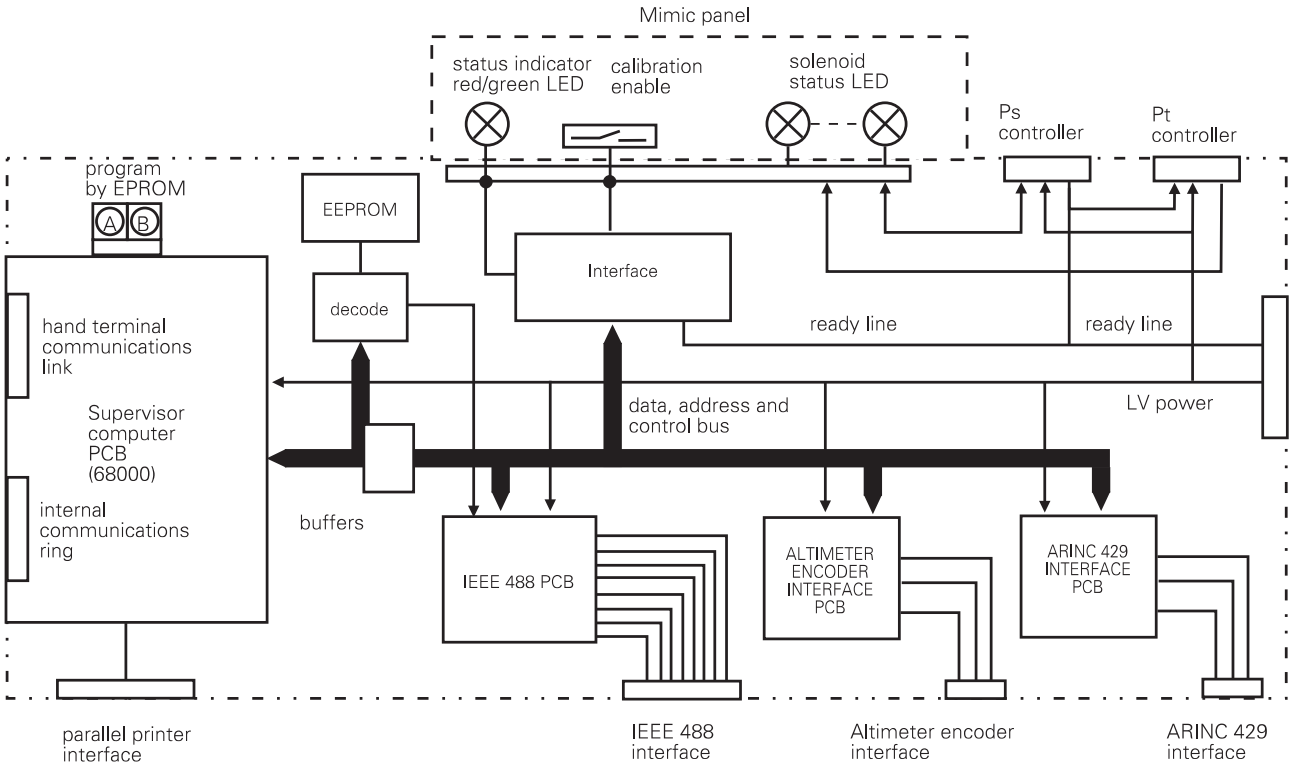


Figure 1-9 Supervisor Computer and Communications

ARINC 429 Interface (special order)

23. The ARINC 429 interface option enables the transmitting of aeronautical and pressure parameter data to the aircraft system. It also monitors ARINC 429 data from the aircraft and shows the data on the display with the corresponding measured parameter from the ADTS 405. The labels used for transmitting and receiving each parameter conform to the standard ARINC 429 labels. The interface is contained on an option PCB and locates and connects into the motherboard. An external connector provides for one transmit and one receive channel. A connector fitted to the front panel provides connection to the aircraft ARINC 429 data bus.

Altimeter Encoder Interface (special order)

24. The altimeter encoder interface receives the 10-bit digital code from the altimeter enabling the ADTS 405 to display the decoded altitude value and the applied aeronautical value. A connector fitted to the front panel provides connection to the altimeter encoding circuit.

IEEE 488 Interface (option E)

25. The IEEE 488 Interface option provides a parallel communications system compatible with either 1975 systems (option E-1) or SCPI protocol (option E-2). Amphenol connectors fitted to the front and rear panels provide connection to a suitable computer.

Pump Rack

26. The rack pump consists of an electric motor driving a pump and controlled by a controller PCB. The rack is cooled by an electric fan. A power supply unit produces electrical power for the motor circuit, fan and circuits to the electronics rack. The electrical supply connector, power switch, elapsed time indicator, fuses and auxiliary pneumatic connections are located on the front panel of the rack.

27. The pump is driven by a brushless DC motor, Hall effect sensors provide feedback to the motor drive circuits.

28. The pump consists of four reciprocating pistons on a central eccentric. One piston head is configured for pressure and the other three for vacuum. Reed valves in the piston heads control the direction of air flow. One of the vacuum heads provides an initial (rough) vacuum that in turn feeds the other two vacuum heads. The output of the pressure head is cooled and then passed through a coalescing filter to extract any condensed water vapour.

29. One of the auxiliary pneumatic connectors is supplied by the initial (rough) vacuum, the other two are for external input of vacuum and pressure or can be used as outputs of the pump.

30. The power supply unit receives power through a switch and fuse to produce 24 V DC for the motor drive circuits and the power indicator.

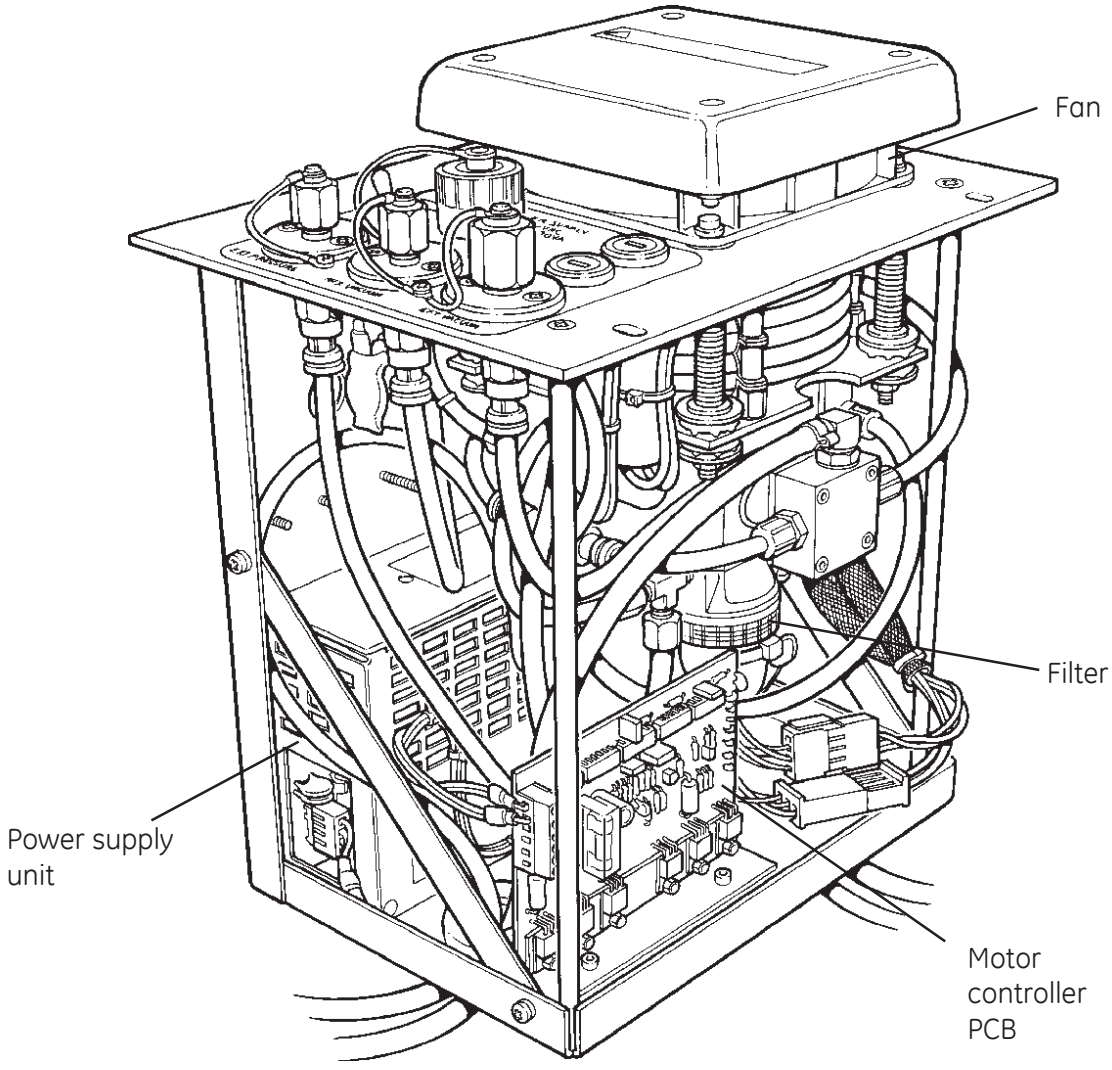


Figure 1-10 Pump Rack

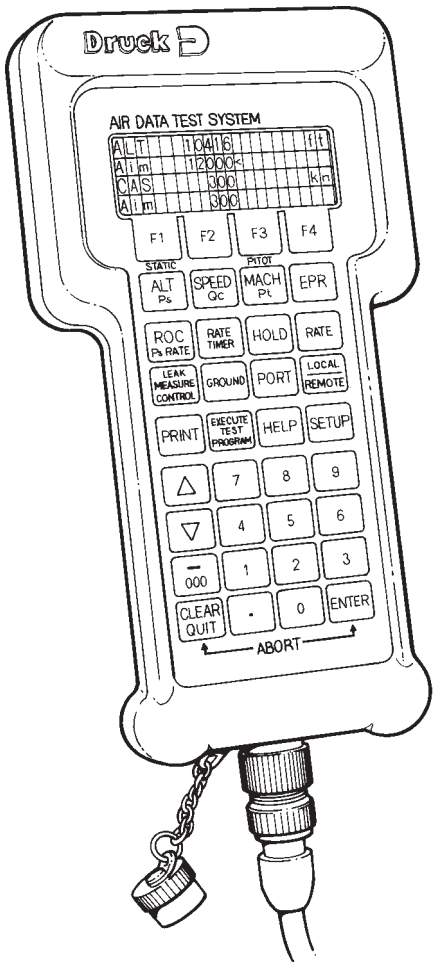


Figure 1-11 Hand Terminal

Hand terminal

Note: The hand terminal is a standard component for the ADTS 405F and option B for the ADTS 405.

31. The hand terminal has a four-key by nine-key matrix to allow single key operation for each system function. An electroluminescent panel provides back lighting for a twenty character by four line liquid crystal display. An internal microprocessor controls the display. All key functions are held in EPROM, an audio tone sounds to confirm a valid key press. The hand terminal connects to the ADTS 405 through the front panel connector, extension cables allow the hand terminal to be used on most flight decks.

Chapter 2

Dismantling

CONTENTS

	Para.
General	1
ADTS 405 and Electronics Rack (ADTS 405F)	2
Cover	5
Controller PCB	6
Computer PCB	9
IEEE 488 Interface PCB	11
Altimeter Encoder Interface PCB	13
ARINC 429 Interface	15
Front Panel	17
Mimic Panel	23
Power Supply Unit	31
Pump Rack (ADTS 405F)	39
Pump Front Panel	45
Pump and Motor Assembly	48
Fan	56
PSU Motor Controller Assembly	59

Illustrations

	fig.
IEEE 488 Interface PCB	2-1
Front Panel	2-2
Output Fitting	2-3
Power Supply Unit Installation	2-4
Pump Rack Details	2-5

DISMANTLING

WARNING: VOLTAGES IN EXCESS OF 30 VOLTS (RMS) AC OR 50 VOLTS DC, IN CERTAIN CIRCUMSTANCES CAN BE LETHAL. CARE MUST BE TAKEN WHEN WORKING ON LIVE, EXPOSED CONDUCTORS.

General

1. Absolute cleanliness of the work area, tools and equipment must be observed. Expendable items must be discarded.

ADTS 405 and Electronics Rack

2. Remove the case lid of the ADTS 405F. Disconnect and remove all the electrical and pneumatic connections.

3. Unscrew and remove the four screws and cup washers securing the rack in case of the ADTS 405F.

4. Carefully position the rack on the side of the ADTS 405F case. Disconnect all pneumatic and electrical connections from rear of the rack and separate the rack from the case.

Cover

5. Unscrew and remove the eighteen screws and shakeproof washers securing the cover to the chassis. Slide cover off to the rear.

Controller PCB

Note: This is part of the Controller/Manifold Assembly comprising this component and the manifold as a matched set.

6. The controller PCB are located at each side the chassis, removal procedures are identical. Disconnect the four connectors from the bottom of the PCB.

7. Unscrew and remove the four nyloc nuts and collect the four nylon spacers. Remove the controller PCB.

PCB retaining bar (Figure 2-1)

8. Unscrew and remove the two nylon wing nuts securing PCB retaining bar. Release the ribbon cable retaining clip and remove retaining bar.

Computer PCB

9. The computer PCB locates in a connector on the motherboard. A ribbon cable connects on the top edge of the PCB.

10. Disconnect the ribbon cable connector on the top edge of the PCB. Carefully remove the PCB.

IEEE 488 Interface PCB (Figure 2-1)

11. The IEEE 488 interface PCB locates on a connector in the motherboard. Release the two clips and disconnect the ribbon connector on the top edge of the PCB.

12. Unscrew and remove the two screws and plain washers securing PCB bracket to rear panel. Carefully remove the PCB.

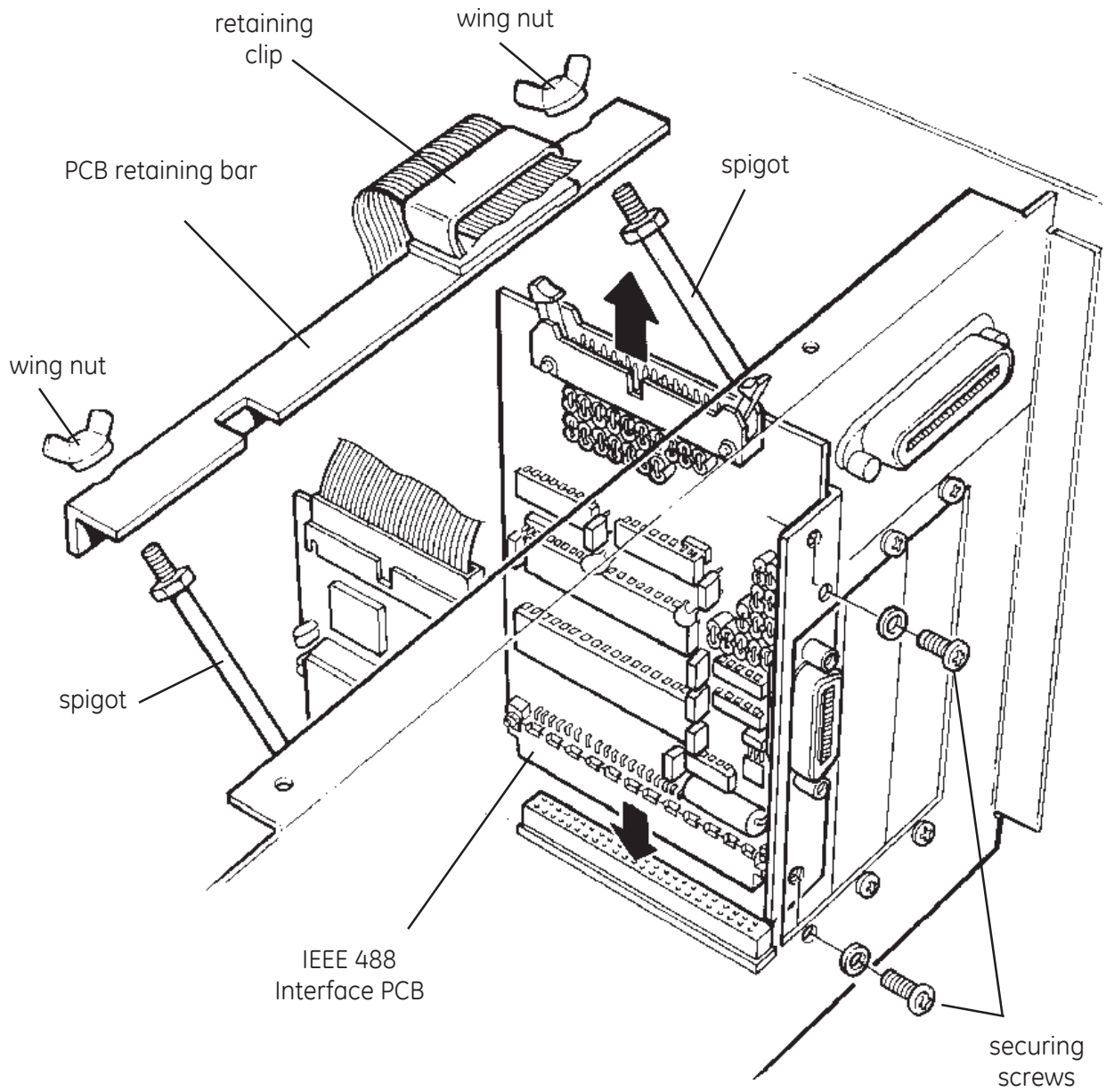


Figure 2-1 Location of the Interface PCB

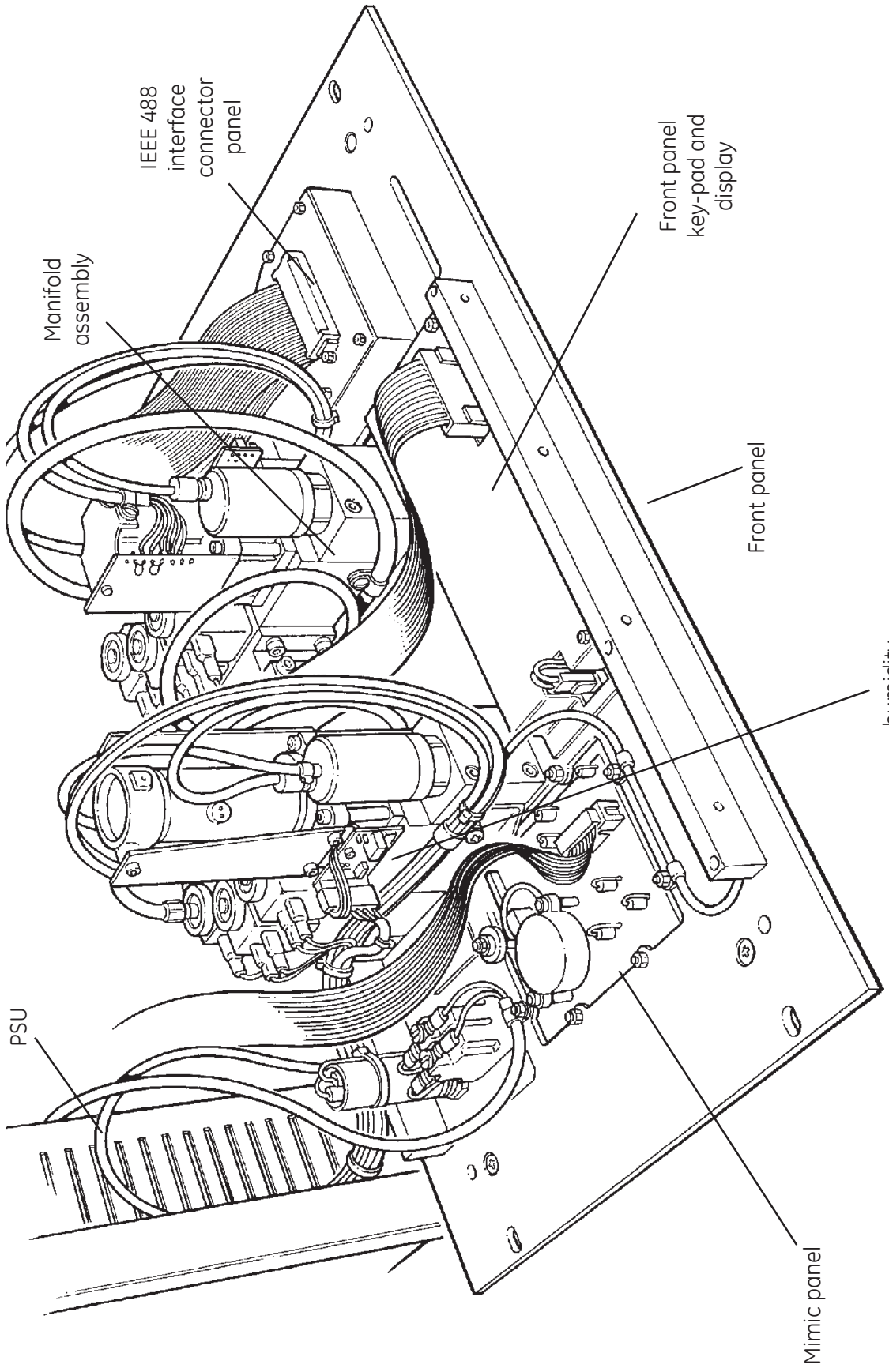


Figure 2-2 Front Panel

Altimeter Encoder Interface PCB (Figure 2-1)

13. The altimeter encoder interface PCB locates on a connector in the motherboard. Release the two clips and disconnect the ribbon connector on the top edge of the PCB.

14. Unscrew and remove the two screws and plain washers securing PCB bracket to rear panel. Carefully remove the PCB.

ARINC 429 Interface PCB (Figure 2-1)

15. The ARINC 429 interface PCB locates on a connector in the motherboard. Release the two clips and disconnect the ribbon connector on the top edge of the PCB.

16. Unscrew and remove the two screws and plain washers securing PCB bracket to rear panel. Carefully remove the PCB.

Front Panel (Figure 2-2)

17. To gain access to other components, lower the front panel as follows:

Note: This procedure does not completely remove the front panel.

18. Disconnect the ribbon cable connector from top edge of IEEE 488 interface PCB.

19. Invert the rack, unscrew and remove the five screws and shake proof washers securing base plate to front panel along front edge of base plate. Restore rack to the correct way up.

20. Unscrew and remove the four screws securing front panel to rear chassis. These are located above and below each handle.

21. Carefully lower the front panel until it is in a horizontal position on the bench.

22. Start to carefully separate the front panel from the chassis and disconnect the ribbon cable from the mimic panel.

Mimic Panel

23. Unscrew and remove the seven nyloc nuts and plain washers securing the mimic panel to the front panel. Remove the mimic panel.

Controller/Manifold Assembly (Figures 2-2 and 2-3)

Caution: Ensure absolute cleanliness of the work area for the following procedure to prevent ingress of dirt into manifold.

24. Tilt the front panel to the vertical position and rest against rear chassis. Remove blanking caps from Ps and Pt output fittings.

25. Unscrew and remove the two screws from each output fitting and remove fittings, rotating slightly to ease removal.

26. Unscrew and remove the two screws from under output fittings securing manifold to front panel. Lower front panel to horizontal position.

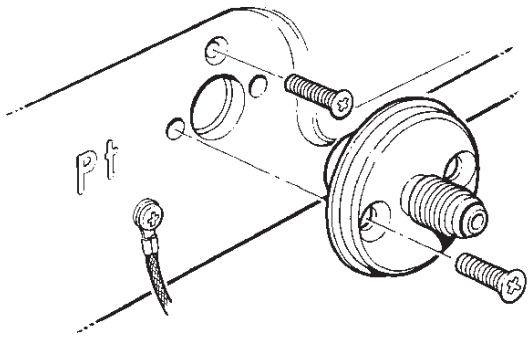


Figure 2-3 Output fitting

27. Remove the p-clips securing the wiring looms to the manifold. Disconnect the two input pipes from the front panel and regulator.

28. Unscrew and remove the three hexagonal socket cap-screws securing the static transducer mounting block to the main manifold. Repeat this operation for the Pitot transducer.

29. Identify and note the cables to all the solenoids. Disconnect the connectors from all solenoids. For solenoids with moulded connectors unscrew and remove the knurled securing nut and washer from the coil and remove the coil.

Caution: The manifold is now free to move. Extreme caution should be taken in further operations to prevent damage to the manifold or other components.

30. Carefully remove the manifold.

Display and key-pad panel

31. Disconnect the ribbon cable connector and two-pin connector from the display.

32. Unscrew and remove the four screws and washers securing the display to the front panel. Remove the display and key-pad.

Power Supply Unit (Figure 2-4)

33. The PSU is contained in a metal enclosure at the right hand side of the rear chassis. To gain access, the Pt controller PCB must be removed from the four mounting studs as follows:

34. Disconnect the nine-pin connector from the PSU enclosure.

35. Unscrew and remove the four nuts securing Pt controller PCB to right hand outside end of rear chassis.

36. Carefully lower Pt controller PCB to the horizontal position, temporarily restrain the PCB.

37. Disconnect the earth bonding wire from the stud on the front panel. Cut and remove the tyrap securing the earth bonding wire and pull through the p-clips.

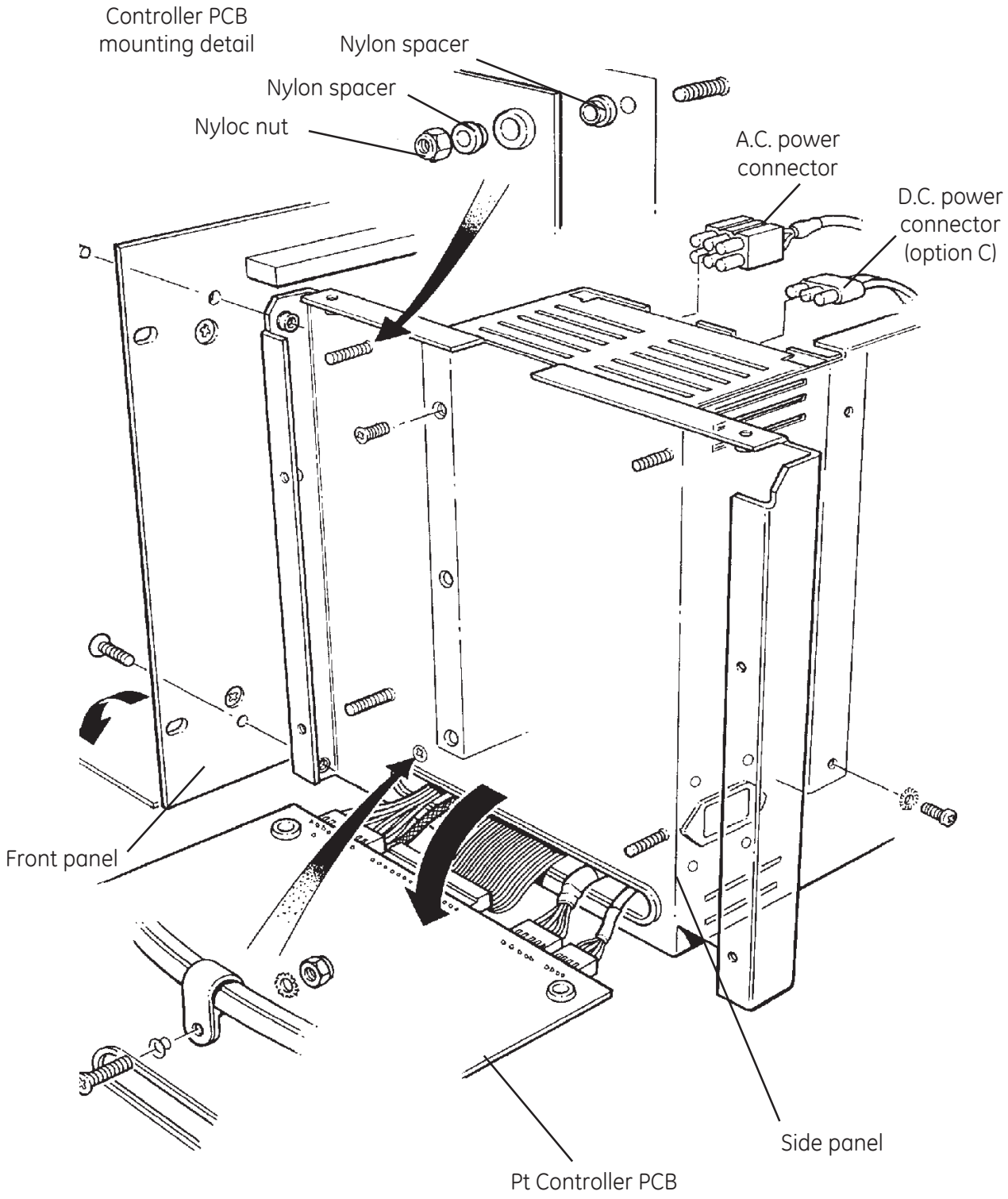


Figure 2.4 Power Supply Unit Installation

38. Remove the insulating sheet from the studs. Unscrew and remove the eight screws and shakeproof washers securing the PSU to the right hand side of rear chassis.

39. Unscrew and remove the four screws securing the PSU to the front panel.

40. Remove the PSU and cover. It may help to carefully lever top cover upwards at a point near the six pin connector.

Pump Rack (ADTS 405F)

41. Unscrew and remove the four screws and cup washers securing the electronics rack in the case.

42. Carefully position the electronics rack on the side of the case.

43. Disconnect all pneumatic and electrical connections from electronics rear of the rack. Temporarily place the rack in the case.

44. Unscrew and remove the four screws and cup washers securing pump unit in the case.

45. Carefully lift out the pump unit and carefully position the pump unit on the case.

46. Unscrew the drain pipe from the bowl filter.

Pump Front Panel (Figure 2-5)

47. Unscrew and remove the four countersunk screws securing pump front panel to pump chassis.

48. While retaining the front panel and pump chassis together, carefully lay pump unit on its side.

49. The front panel can now be carefully pulled slightly away from the chassis to give better access to other components.

Pump and Motor Assembly (Figure 2-5)

50. Disconnect the pressure pipe between the bowl filter on the pump assembly and the rear of the rack.

51. Disconnect the vacuum line between the pump assembly and the unit rack by removing the swivel, right-angle fitting from the pump assembly, collect the bonded seal.

52. Make note of the orientation of the three pipes from pump assembly to pump front panel. Remove the three pipes by sliding the red locking rings on the pressure connectors towards the front panel and then pulling the pipes out.

53. Disconnect the two electrical connectors from the motor.

54. Remove sealant from the four nuts securing pump and motor assembly to the mounting pillars, then remove the nuts and washers.

55. Carefully remove the pump and motor assembly from front panel.

Fan

56. Pull back the outer sleeving as necessary to gain access to the cables. Cut and remove any tyraps securing the cable loom. Disconnect the red and black cables at the terminal block under the front panel.

57. From the top of the pump front panel, unscrew and remove the four screws, stiff nuts and plain washers securing fan cover to fan.

58. Unscrew and remove the four hexagonal socket cap-screws securing the fan to the front panel (this breaks the water seal). Remove the fan.

PSU Motor Controller Assembly

59. Cut and remove any tyraps securing the cable looms attached to the PSU.

60. Disconnect the electrical connectors from the PSU and motor controller.

61. Unscrew and remove the two screws and plain washers securing the motor controller PCB.

62. Unscrew and remove the four screws and shakeproof washers securing PSU.

63. Remove the motor controller and PSU.

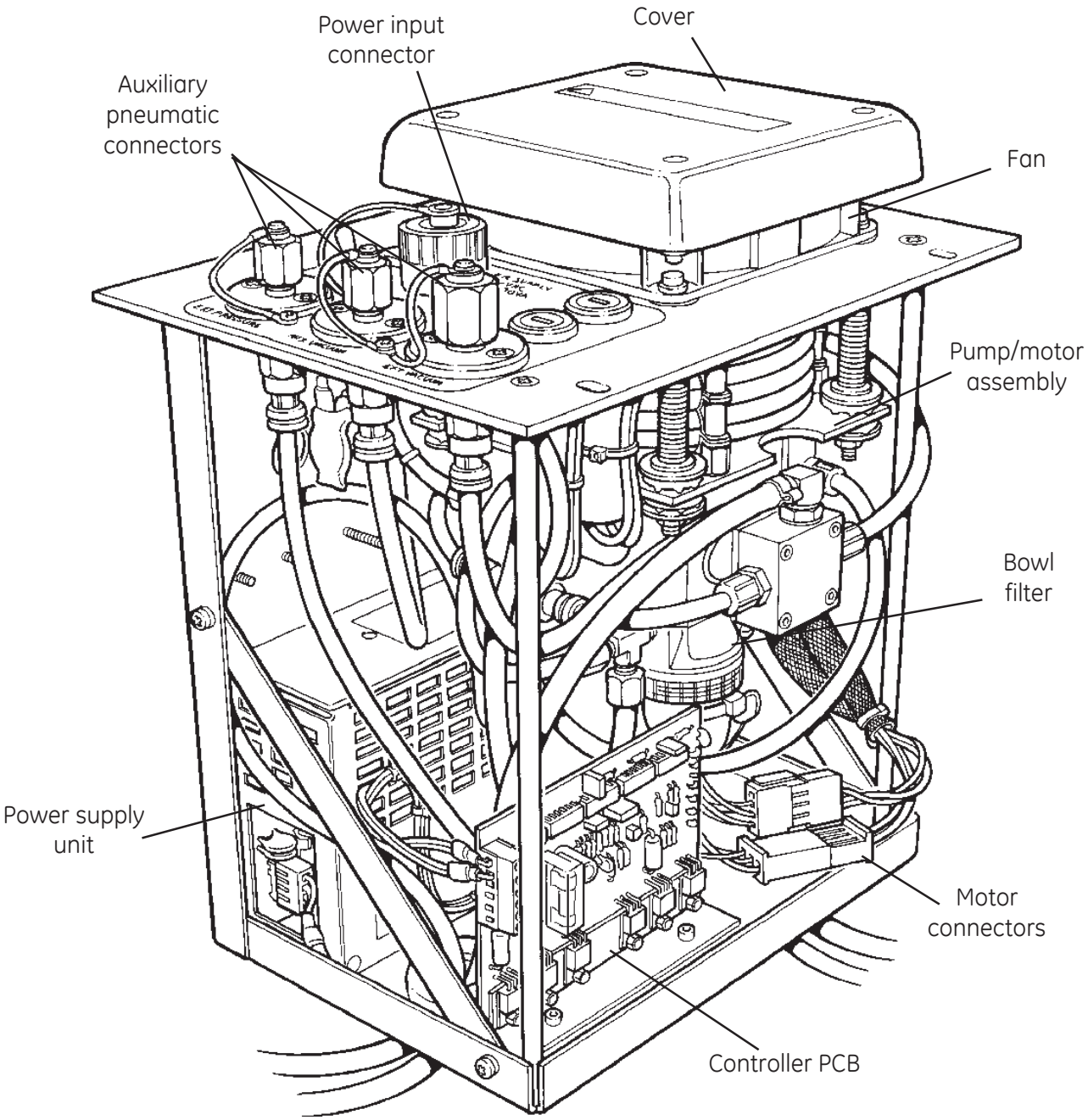


Figure 2.5 ADTS 405F pump rack details

Chapter 3

Assembling

CONTENTS

	Para.
General	1
Pump Rack (ADTS 405F)	2
PSU Motor Controller Assembly	2
Fan	5
Pump and Motor Assembly	11
Pump Front Panel	17
ADTS 405 and Electronics Rack (ADTS 405F)	19
Power Supply Unit	19
Manifold Assembly	25
Mimic Panel	29
Front Panel	30
IEEE 488 Interface PCB	32
Altimeter Encoder Interface PCB	35
ARINC 429 Interface	38
Computer PCB	41
Controller PCB	46
Cover	48
Final Assembly (ADTS 405F)	49
Pump Rack	49
Electronics Rack	51

Illustrations

	fig.
Solenoid valves	3-1

ASSEMBLING

General

1. Ensure all parts are clean, absolute cleanliness of the work area, tools and equipment must be observed.

Pump Unit (ADTS 405F)

PSU Motor Controller Assembly

2. Secure the PSU to the side panel of the pump rack using the four screws and shakeproof washers.

3. Secure the motor controller PCB with the two screws and plain washers.

4. Connect the input and output connections to the PSU. Connect the two cables to the connector block on the controller PCB.

Fan

5. Before assembling, carefully apply Dow Corning Silastic 732RTV sealant to the lower face of the fan and locate the fan on the front panel.

Note: Avoid sealant on the fan blades. Ensure the sealant is continuous around periphery of the fan.

6. Locate the fan on the front panel of the pump rack and secure with the four hexagonal socket cap-screws and washers.

7. Insert the red and black cables into the outer sleeving and route the cable to the terminal block under the front panel.

8. Crimp a terminal connector to each cable.

9. Connect each cable to the terminal block. Slide the insulating sleeve over each connection.

10. Pull the outer sleeving over the cable loom and secure with tyraps.

Pump and Motor Assembly

11. Before assembling, carefully apply Dow Corning Silastic 732RTV sealant to the stiff nuts and anti-vibration washers securing pump and motor assembly to pillars.

12. Fit an anti-vibration washer to each mounting pillar and then locate the pump/motor assembly with the four anti-vibration washers and stiff nuts.

13. Connect the two electrical connectors to the motor.

14. Connect the three pipes to the connectors under the front panel in their previously noted positions.

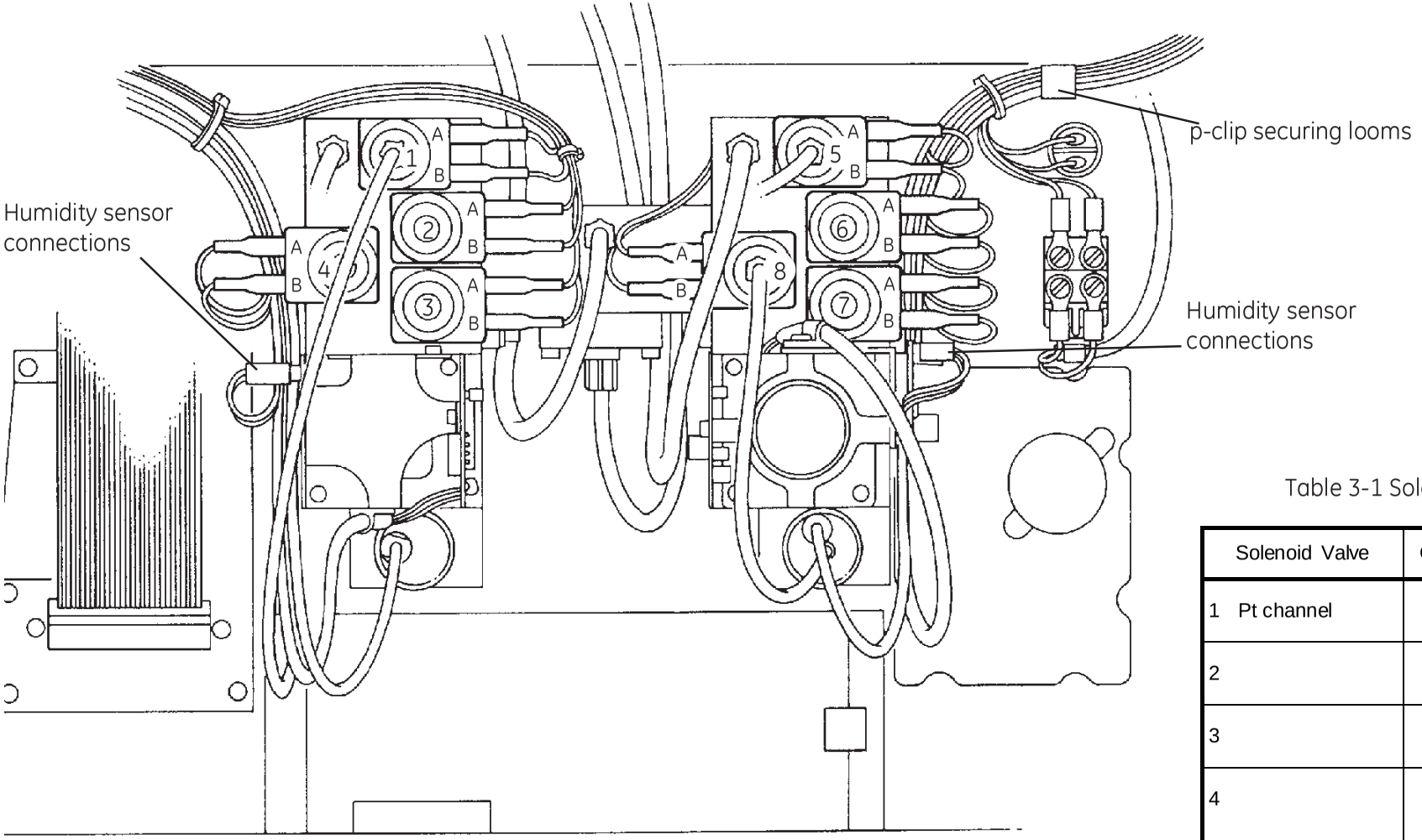


Figure 3-1 Solenoid Valves

Table 3-1 Solenoid Valves

Solenoid Valve	Cable	Colour
1 Pt channel	A B	yellow black
2	A B	orange black
3	A B	brown black
4	A B	red black
5 Ps channel	A B	yellow black
6	A B	orange black
7	A B	black brown
8	A B	black red

15. Locate a new bonded seal to the right-angle fitting and connect the vacuum pipe to the pump unit.

16. Connect the pressure pipe to the bowl filter.

Pump Front Panel

17. Carefully align the front panel over the partially assembled pump unit and secure with the four countersunk screws.

18. Refer to final assembly para. 51.

ADTS 405 and Electronics Rack (ADTS 405F)

Power Supply Unit

19. Fit the PSU board to the motherboard. Locate the cover over the PSU board.

20. Route the earth bonding wire through the p-clips. Connect the earth bonding wire to the stud on the front panel.

21. Secure the PSU cover to the side panel of the rack with the eight screws and shakeproof washers.

22. Carefully locate the Pt controller PCB on the studs of the side panel. Secure the Pt controller PCB with the four spacers and nuts.

23. Secure the PSU cover to the rear panel of the rack with the four screws and shakeproof washers.

24. Connect the nine-pin connector to the PSU cover.

Manifold Assembly (Figure 3-1)

25. Locate the manifold on the front panel and secure with the two screws.

26. Position the connectors through the slots in the side panels.

27. Carefully insert the output fittings through the front panel into the manifold, rotating slightly to ease fitment. Secure each fitting with two screws. Refit the p-clips securing the cable looms to the manifold assembly.

28. Connect the two input pipes, one to the front panel Ps connector and the other to the pressure regulator. Connect the cables to the solenoid valves, refer to table 3-1.

Note: For solenoids with a moulded connection refit the solenoid over the valve and screw on the washer and knurled securing nut.

Mimic panel

29. Locate the mimic panel on the front panel and secure with the seven nyloc nuts and plain washers.

30. Connect the ribbon cable to the mimic panel.

Display and key-pad panel

30. Locate the key-pad and display on the front panel and secure the display with the four screws and washers.

31. Connect the two-pin and ribbon cable connectors to the display.

Front Panel

Caution: Do not trap any cables between front panel and rear chassis.

32. Locate the four screws through the holes in the front panel, above and below each handle. Secure the front panel to the side panels.

33. Invert the partially assembled rack and secure the base plate along the front edge with five screws and shakeproof washers. Reposition the partially assembled rack.

IEEE 488 Interface PCB

Note: Make sure the PCB connections are correctly aligned on the motherboard.

34. Carefully insert the PCB into motherboard and align the holes in the PCB bracket with the rear panel of the rack.

35. Secure the PCB with the two screws and plain washers.

36. Connect the ribbon cable connector to the top edge of the PCB and secure with the two clips.

Altimeter Encoder Interface PCB

Note: Make sure the PCB connections are correctly aligned on the motherboard.

37. Carefully insert the PCB into motherboard and align the holes in the PCB bracket with the rear panel of the rack.

38. Secure the PCB with the two screws and plain washers.

39. Connect the ribbon cable connector to the top edge of the PCB and secure with the two clips.

ARINC 429 Interface PCB

Note: Make sure the PCB connections are correctly aligned on the motherboard.

40. Carefully insert the PCB into motherboard and align the holes in the PCB bracket with the rear panel of the rack.

41. Secure the PCB with the two screws and plain washers.

42. Connect the ribbon cable connector to the top edge of the PCB and secure with the two clips.

Computer PCB

Note: Make sure the PCB connections are correctly aligned on the motherboard.

43. Carefully insert the PCB into motherboard.

44. Connect the ribbon cable connector to the top edge of the PCB.

PCB Retaining bar

45. Fit the retaining bar on the spigots make sure that the PCB are secured by the bar but not under tension. If necessary, adjust the nuts on the spigots.

46. Secure the ribbon cable in the clip on the retaining bar.

Caution: Do not over-tighten the nylon wing nuts the PCB can be damaged.

47. Carefully fit the nylon wing nuts.

Controller PCB

48. Fit the insulating sheet on the studs. Locate the controllers PCB on the appropriate side panel and connect the connectors to the controller PCB.

49. Secure each controller PCB with four nylon spacers and nyloc nuts.

Cover

50. Slide the cover over the rear of the assembled rack, align the holes and secure the cover with the eighteen screws and shakeproof washers.

Note: This completes the assembly of the ADTS 405.

Final Assembly (ADTS 405F)

Pump Rack

51. Place the cables and output pipes of the pump rack through the case. Connect the drain pipe to the bowl filter.

52. Carefully place pump rack in the case, apply Dow Corning Silastic 732RTV sealant to the securing screws. Secure the rack in the case.

Electronics Rack

53. Connect the output pipes and cables to the rear panel of the electronics rack.

54. Carefully place the electronics rack into the case, apply Dow Corning Silastic 732RTV sealant to the securing screws. Secure the rack in the case.

Chapter 4

Testing

CONTENTS

Para.

STANDARD SERVICEABILITY TEST
General 1
Procedure 2
FUNCTIONAL TEST
Introduction 8
Procedure 10
IEEE 488 Interface test 19
IEEE 488 test Program 20

STANDARD SERVICEABILITY TEST

General

1. The following procedure can be used to check the functions and facilities of the ADTS 405. When one of the keys on the hand terminal or local key-pad is referred to, the term PRESS is used, e.g. Press ALT. When a menu item on the display is referred to, the term SELECT is used. In the text, the menu item is enclosed in square brackets, e.g. Select [MORE]. Menu items are selected using the appropriate function or 'soft' keys F1, F2, F3 and F4. The menu items may be shown either over the function keys or as a list on the display.

Procedure

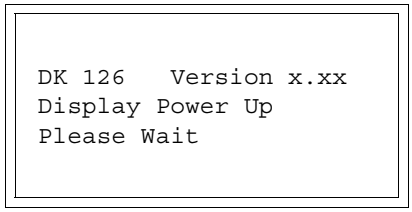
Connection and power-on checks

2.

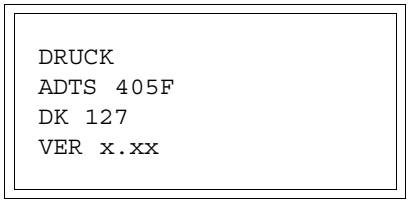
(1) Connect power to the unit, connect the hand terminal. Ensure that the blanking caps are fitted to the Ps and Pt front panel outputs.

(2) Switch the unit on using main power switch. Switch the pumps on using pump power switch.

(3) Check power indicator is ON. Check the display shows the power-up message as below (where x is the issue number of the installed software version number):



(4) Check the power-up message displays as below (where x is the issue number of the installed software version number):



3. The ADTS 405 will display any errors that are detected. Check that the power-up sequence continues through the following stages without error:

Self Test

Measuring Ground Pressures

Equalizing System Pressures

4. Check that the display then changes to show measured altitude and airspeed (CAS) values.

Note 1: The display shows the "WARM-UP" message in the lower right corner. This signifies that full pressure accuracy may not be achieved. The WARM-UP message clears after approximately 15 minutes. The WARM-UP indication does not inhibit operation and these tests may proceed without waiting for the flag to clear.

Note 2: An automatic zero takes place (if enabled) on a regular basis. The word "ZERO" appears on the display and the state of the valves, on the mimic panel, changes for approximately six seconds. This is normal operation. Commands may still be entered while auto -zero takes place.

Key-pad Check

5. Press the MACH key and check the display changes to show Altitude and Mach measured values.

Pump unit

6. Switch on the pump unit.

    (1) Press CONTROL to go to control mode. Enter an altitude aim of 5000 ft by pressing 5, 0, 0, 0, ENTER.

    (2) Enter an airspeed aim of 500 knots by pressing SPEED, 5, 0, 0, ENTER.

    (3) Check that these aim values are achieved.

Completion

7. On successful completion of this test procedure, switch off the unit and the power supply.

FUNCTIONAL TEST

Introduction

8. This test verifies that the ADTS 405 is fully functioning, all external interfaces are tested. When one of the keys is referred to, the term PRESS is used, e.g., Press ALT. When a menu item on the display is referred to, the term SELECT is used. In the text, the menu item is enclosed in square brackets, e.g., Select [MORE]. Menu items are selected using the appropriate function or 'soft' keys F1, F2, F3 and F4. The menu items may be shown either over the function keys or as a list on the display.

Test Equipment

9. The following test equipment is required for this procedure:

   i. PC compatible computer with IEEE 488 interface card and cable.
   ii. PC-based test program for IEEE 488 communications.

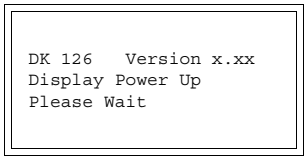
Procedure

10. Connection and power-on checks

   (1) Connect power to the unit, connect the hand terminal. Ensure that the blanking caps are fitted to the Ps and Pt front panel outputs.

   (2) Switch the unit on using main power switch. Switch the pumps on using pump power switch.

   (3) Check power indicator is ON. Check the display shows the power-up message as below (where x is the issue number of the installed software version number):



   (4) Check the power-up message displays as below (where x is the issue number of the installed software version number):

11. The ADTS 405 will display any errors that are detected. Check that the power-up sequence continues through the following stages without error:

   Self Test

   Measuring Ground Pressures

   Equalizing System Pressures

12. Check that the display then changes to show measured altitude and airspeed (CAS) values.

Note 1: The display shows the "WARM-UP" message in the lower right corner. This signifies that full pressure accuracy may not be achieved. The WARM-UP message clears after approximately 15 minutes. The WARM-UP indication does not inhibit operation and these tests may proceed without waiting for the flag to clear.

Note 2: An automatic zero takes place (if enabled) on a regular basis. The word "ZERO" appears on the display and the state of the valves, on the mimic panel, changes for approximately six seconds. This is normal operation. Commands may still be entered while auto -zero takes place.

Key-pad Check

13. This verifies the hand terminal key-pad operation.

    (1) Press the MACH key and check the display changes to show Altitude and Mach measured values.

    (2) Press each key in turn in the order shown below and check that the hand terminal beeps on each key press.

    Note: The display shows a warning message when the EPR key is pressed. This message should be ignored. Do not press the QUIT key to clear the warning message.

    F1, F2, F3, F4, ALT, SPEED, MACH, EPR, ROC, RATE TIME, HOLD, RATE,
    LEAK MEASURE, GROUND, PORT, LOCAL, PRINT, EXEC. TEST PROGRAM, HELP,
    SETUP, UP ARROW, 7, 8, 9, DOWN ARROW, 4, 5, 6, 000, 1, 2, 3, CLEAR, ., 0, ENTER

14. Change the units to mbar as follows:

    (1) Press SETUP then select [UNITS]. Repeatedly select [NEXT] until the display shows “mbar”.

    (2) Select [SAVE] and then press QUIT twice and the display now shows Ps and Pt in units of mbar.

Controller stability

15. This section verifies the control stability.

    (1) Press CONTROL to turn the pressure controllers ON.
    “AIM” replaces “LEAK MEASURE” on the display.

    (2) Enter a Ps aim of 510 mbar with a rate of change of 204 mbar/min. by pressing the following: Ps, 5, 1, 0, ENTER, Ps RATE, 2, 0, 4, ENTER.

    (3) Enter a Qc aim of 0 mbar with a rate of change of 204 mbar/min. by pressing the following: Qc, 0, ENTER, RATE, 2, 0, 4, ENTER.

    (4) Press Ps and wait for the aim values to be achieved.

    (5) If auto zero is enabled, wait for an auto zero to take place. During auto zero, the valve state changes on the mimic panel and the display shows “ZERO” in place of the airspeed aim value. The time to auto zero should be less than 1 minute from achieving the aim value.

    (6) Wait for a minimum of 20 seconds after auto zero before proceeding.

    (7) Observe the measured values of Ps and Qc on the display for 1 min.

    (8) Check that the displayed value of Ps remains within ±0.068 mbar.

    (9) Check that the displayed value of Qc remains within ±0.068 mbar.

    Note: If a further auto zero takes place, allow the display to stabilise following the auto zero before proceeding.

Vacuum leak check

16. This section verifies that the unit is leak tight under vacuum conditions.

    (1) Press LEAK MEASURE to turn the controllers off.

    (2) Press RATE TIME and select WAIT 05:00, TIME 01:00. Observe that the WAITING time is shown on the display as it counts down, followed by the TIMING time.

    (3) At the end of the TIMING period, press ROC to display the measured rate of change of Ps ("T" is shown after the value indicating a timed average).
    Check that the Ps Rate is less than or equal to ±0.5 mbar/min.

    (4) Press RATE to display the measured rate of change of Qc.
    Check that the Qc Rate is less than or equal to ±0.5 mbar/min.

    (5) Check that the displayed valve of Ps and Qc both remain within ±0.5 mbar.

    (6) Press Pt to display the measured rate of change of Pt.
    Check that the Pt Rate is less than or equal to ±0.5 mbar/min.

Pressure leak check

17. This section verifies that the unit is leak tight under positive pressure conditions.

    (1) Press CONTROL to turn the pressure controllers ON.
    The display shows "AIM" in place of "LEAK MEASURE".

    (2) Enter a Ps aim of 1016 mbar by pressing: Ps, 1, 0, 1, 6, ENTER.

    (3) Enter a Qc aim of 272 mbar by pressing: Qc, 2, 7, 2, ENTER.
    Wait for the aim values to be achieved then wait for 1 min.

    (4) Press LEAK MEASURE to turn the controllers OFF.

    (5) Press RATE TIME and select WAIT 05:00, TIME 01:00. Observe that the WAITING time is shown on the display as it counts down, followed by the TIMING time.

    (6) At the end of the TIMING period, press RATE to display the measured rate of change of Qc ("T" is shown after the value indicating a timed average).

    (7) Check that the Qc Rate is less than or equal to ±0.5 mbar/min.
    If the leak rate is not achieved, allow further thermal stabilizing time and re-test by pressing RATE TIME and selecting WAIT 05:00, TIME 01:00.

18. Using key presses based on the above, control the Ps and Qc pressures to the normal limits of operation and ensure that these are achieved. Use minimum Ps and zero Qc and then maximum Ps and maximum Qc.

Note: Do not exceed the maximum Pt as shown on the front panel of the unit. Use maximum available rates of change to minimise test times. See User Manual K114 for further information on setting limits.

IEEE 488 interface test

19. This section verifies IEEE 488 operation.

(1) Ensure that the IEEE 488 address of the ADTS 405 is set to 1 as follows:

a. Hold down F1 and press SETUP to display the CONFIG menu.
b. Select [MORE], [DISPLAYS/OPTIONS], [OPTIONS], [IEEE 488], [DEVICE ADDRESS]. Enter an address of 1 by pressing 1 then ENTER.
c. Press QUIT.

(2) Switch off the unit and pumps.

(3) Connect the PC with IEEE 488 interface to the IEEE 488 connector under the cover on the front panel.

(4) Switch on the unit. Wait until the display shows altitude and airspeed.

(5) Run the test program on the PC.

(6) Check that "REMOTE" appears in the lower right corner of the display.

(7) Check that "PASSED" is displayed on the PC.

(8) Switch off the unit and disconnect the PC and IEEE 488 cable.

IEEE 488 test program

20. The following test program should be implemented on an IBM PC or compatible computer. The test program is shown in pseudo code. The exact details of the commands depend on the actual IEEE 488 interface card used and the language used for programming.

(1) Definitions

string1 = "SOURCE:STATE OFF" (one space between STATE and OFF)
string2 = "SOURCE:STATE?" (one space between STATE and OFF)

(2) Program

Open channels to the IEEE 488 interface card for control and data.

```
Set up interface as:
                    Device address = 1
                    Time out 5 secs or greater.
                    EOI with last byte out.
                    Input terminated by EOI
Send Interface Clear.
Send string1 to device 1.
Send string2 to device 1.

Instruct device 1 to TALK and input the response string.
IF device time-out THEN
        Display "FAILED - TIME-OUT"
        STOP
ENDIF
IF response string = "OFF"
THEN
        Display "PASSED"
ELSE
        Display "FAILED"
ENDIF
```

End of IEEE 488 test program.

Chapter 5

Calibration

CONTENTS

	Para.
General	1
Introduction	2
Rate calibration	8
Calibration check	10
Procedure	17
Completion	18

CALIBRATION

General

1. For optimum calibration accuracy, the ADTS 405 should be connected to the pressure standard using metal, PTFE or high density polyethylene hoses to avoid contamination of the internal sensors. This is particularly important when using an EXTERNAL pressure source.

2. Allow one hour for the ADTS 405 to thermally stabilize after power on and before performing any calibration routines.

3. The ADTS 405 incorporates an automated calibration facility that can be controlled through the hand terminal or the IEEE 488 SCPI interface. The calibration can be performed with the ADTS 405 as the pressure source or by using the pressure standard as the pressure source. The recommended method is to use the ADTS 405 as the pressure source as this is the normal mode of operation of the ADTS 405. Three different calibration functions are provided:

Calibration Check

4. This is used to verify accuracy of the calibration without adjusting it.

Rate Calibration

5. This is used to adjust the control transducers to the main transducer to ensure accurate rate control. Rate calibration does not affect ADTS 405 pressure measurement accuracy.

Main Calibration

6. This is used at depot level and should be carried out by qualified personnel.

Purging

7. If contamination by water vapour is suspect use the calibration check facility to purge and leak check the ADTS 405 and calibration standard as follows:

   (1) Enter the calibration check facility and select the required calibration mode.

   (2) Apply a vacuum from the calibration pressure source. Maintain for five minutes.

   (3) Return the pressure to approximately atmospheric pressure using the calibration media (dry air). (Do not vent to atmosphere). Repeat twice more.

   (4) Apply a suitable pressure, allow to stabilize and leak test the ADTS 405 and calibration system.

Rate Calibration

8. Rate calibration should only be performed if the rate accuracy is suspect. The accuracy of measure or controlled pressures are not affected by a rate calibration.

9. Select [RATE CAL], rate calibration takes less than two minutes.

Note: For the rate calibration to be performed, pressure and vacuum supplies need to be connected and the Ps and Pt outlets blanked.

Calibration Check

10. The procedure for calibration check compares the entered aim values and the actual values. With a dual channel check the [Ps END] must be selected to close a valve to protect Ps sensor. Pressures must be applied in ascending order.

Note: Pt channel is checked in absolute mode, with Auto Zero automatically disabled.

11. Differential Qc or airspeed accuracy may be checked in normal user mode. For optimum differential accuracy during these tests, auto zero should be ON. This is particularly significant for very low airspeed work.

Pressure source

12. Select the pressure source to be used during the calibration.

Internal

(1) This is the recommended method of calibration using the pressure controllers within the ADTS 405 to generate the required pressures for calibration. The AIM value and RATE of change of pressure can be entered as required.
To use this mode, vacuum and dry air must be connected.

External

(2) In this mode the ADTS 405 is in measure mode. This should only be used when the pressure standard generates the pressure.

Channel selection

13. Select the channel for checking:

Ps channel - absolute

14. This enables a check of the Ps channel, using an absolute pressure standard.

(1) Connect the pressure standard to the Ps output on the front panel.
Fit the blank on the Pt output.

Pt channel - absolute

15. This enables a check of the Pt channel, using an absolute pressure standard.

(1) Connect the pressure standard to the Pt output on the front panel.
Fit the blank on the Ps output.

Combined Ps and Pt channel - absolute

16. This enables a combined check of the Ps and Pt channels minimising calibration time and the errors due to pressure standard non-repeatability.

(1) Connect the calibration standard to the Pt output on the front panel.
Fit the blank on the Ps output.

(2) Apply the pressures in ascending order starting from the lowest pressure.
Each value will be used as a check point for both Ps and Pt until [Ps END] is selected.
At this point, the Ps check is complete, a valve closes to protect the Ps channel, and the remaining points only used for the Pt channel.

Procedure

17. The calibration check should be carried out with the ADTS 405 in the normal operating mode.

The following equipment is required:
Note: Equivalent substitutes can be used.

- Pressure standard absolute and gauge — accuracy ±0.01%FS
- IBM PC — with IEEE 488 interface

(1) Connect the pressure standard.

(2) Switch on the ADTS 405 and wait for the start-up sequence to take place.

(3) After a successful start-up sequence, enter the calibration mode by simultaneously pressing keys F1 and F4.

The display shows:

```
(CALIBRATION)
F1 MAIN CALIBRATION
F2 CALIBRATION CHECK
F3 RATE CALIBRATION
```

Note: The main calibration facility is used at depot level by qualified personnel.

(4) Press F 2 - Calibration check.

(5) Switch on the pump unit.

(6) Select the pressure source - internal.

(7) Set the channel to be checked:

```
Ps
Pt
Ps and Pt
```

(8) Select the combined channel check - Ps and Pt.

Note: For only checking the Ps channel, use the values in table 5-2.

(9) Enter the first aim value in table 5-1 and record the value on the pressure standard.

(10) Repeat this for further values in table 5-1 until after point 8 press [Ps END].

CAUTION: THE Ps SENSOR WILL BE OVER-PRESSURED AND DAMAGED UNLESS [PsEND] IS SELECTED.

(11) Enter the remaining values in table 5-1 for the Pt channel and then press [Pt END].

(12) Compare the recorded values and with the applied values, the difference must not be greater than ±0.012% Ps and ±0.015% Pt of the applied values.

(13) If the difference exceeds these values, repeat the procedure. If the differences still exceed these values, return the unit to depot.

Completion

18. When the calibration check is complete, repeatedly use the QUIT key to return to the first calibration screen.

i. If necessary, carry out a rate calibration or press QUIT can be pressed again to exit calibration mode.

ii. Select go to ground or stay at the current pressure.

Table 5-1
Calibration Check Points
(both channels)

Point	Calibration Pressure	
	inHg	mbar
1	1	34
2	5.1	173
3	10.2	345
4	15.3	518
5	20.4	691
6	25.4	860
7	30.5	1033
8*	38.7	1311
9«	50.9	1724
10«	63.1	2137
11«	80	2709

* Ps END

« Pt value only

Table 5-2
Ps Calibration Check Points

Point	Calibration Pressure	
	inHg	mbar
1	1	34
2	3.1	105
3	5.1	173
4	7.1	240
5	10.2	345
6	15.3	518
7	20.4	691
8	25.4	860
9	30.5	1033
10	34.6	1172
11	40	1355

Table 5-3
Calibration Check Points
Special version
(both channels)

Point	Calibration Pressure	
	inHg	mbar
1	1	34
2	5.1	173
3	10.2	345
4	20.4	691
5	30.5	1033
6*	38.7	1311
7«	50.9	1724
8«	63.1	2137
9«	77.4	2621
10«	89.6	3034
11«	103.4	3502

Chapter 6

Illustrated Parts List

CONTENTS

	Para.
Introduction	1
Parts List	5
Index of Part Numbers	6

Illustrations

	fig.
ADTS 405F Electronics Rack	6-1
ADTS 405F Pump Rack	6-2
ADTS 405	6-3

Illustrated Parts List

Introduction

1. The purpose of this list is to itemise the parts that comprise the unit. It is intended for use in provisioning, requisitioning and storing replacement parts.

2. In general, parts are listed in order of disassembly, and are indented to show their relationship to the next higher assembly.

3. Numerical indexes are provided to assist in locating part numbers in the Parts List.

4. Items that are non-procurable are indicated in the QTY column by the letters NP. Items that are for reference are indicated by the letters ref. Items that are not illustrated have a † symbol next the item/ref number.

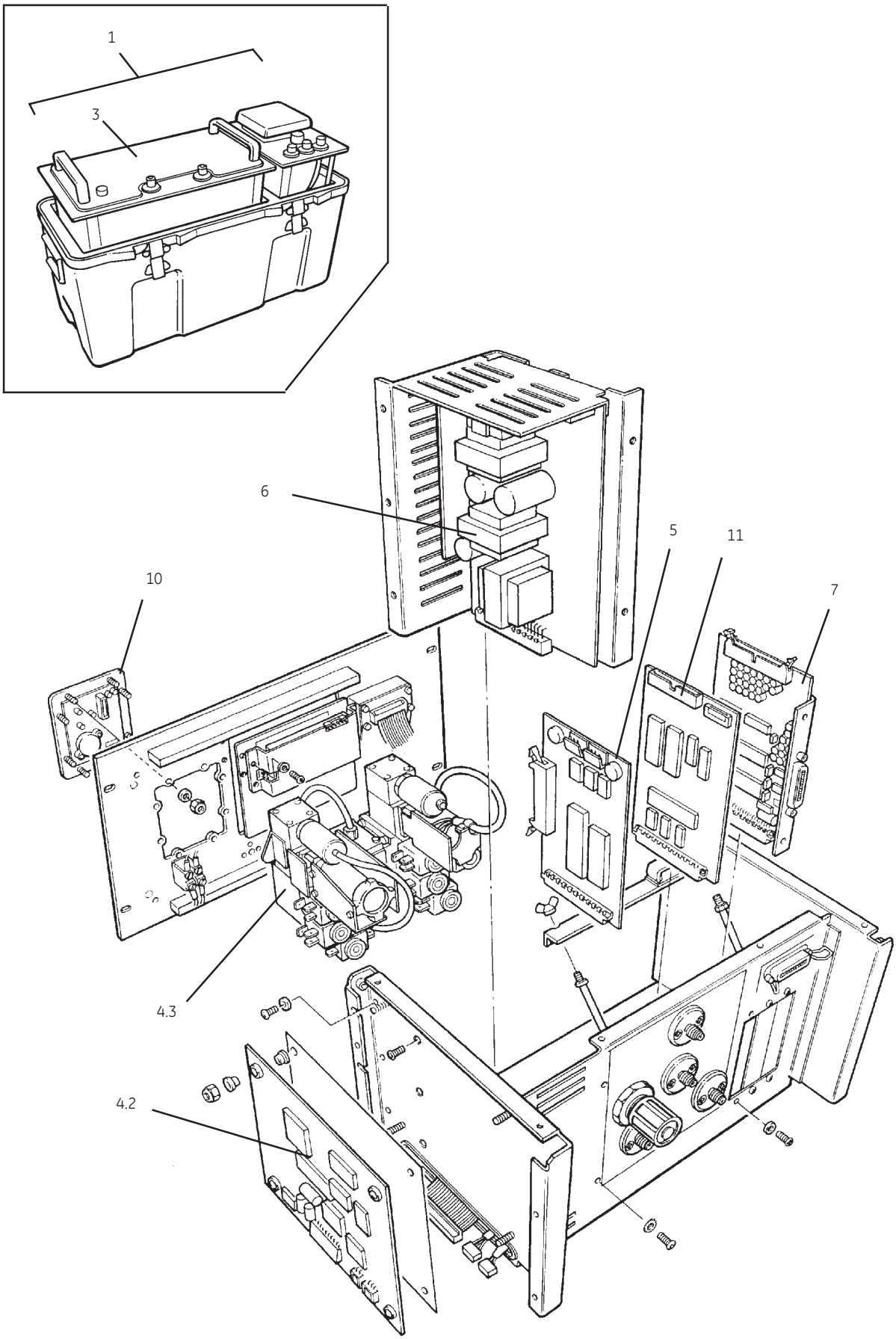


Figure 6-1 ADTS 405F Electronics Rack

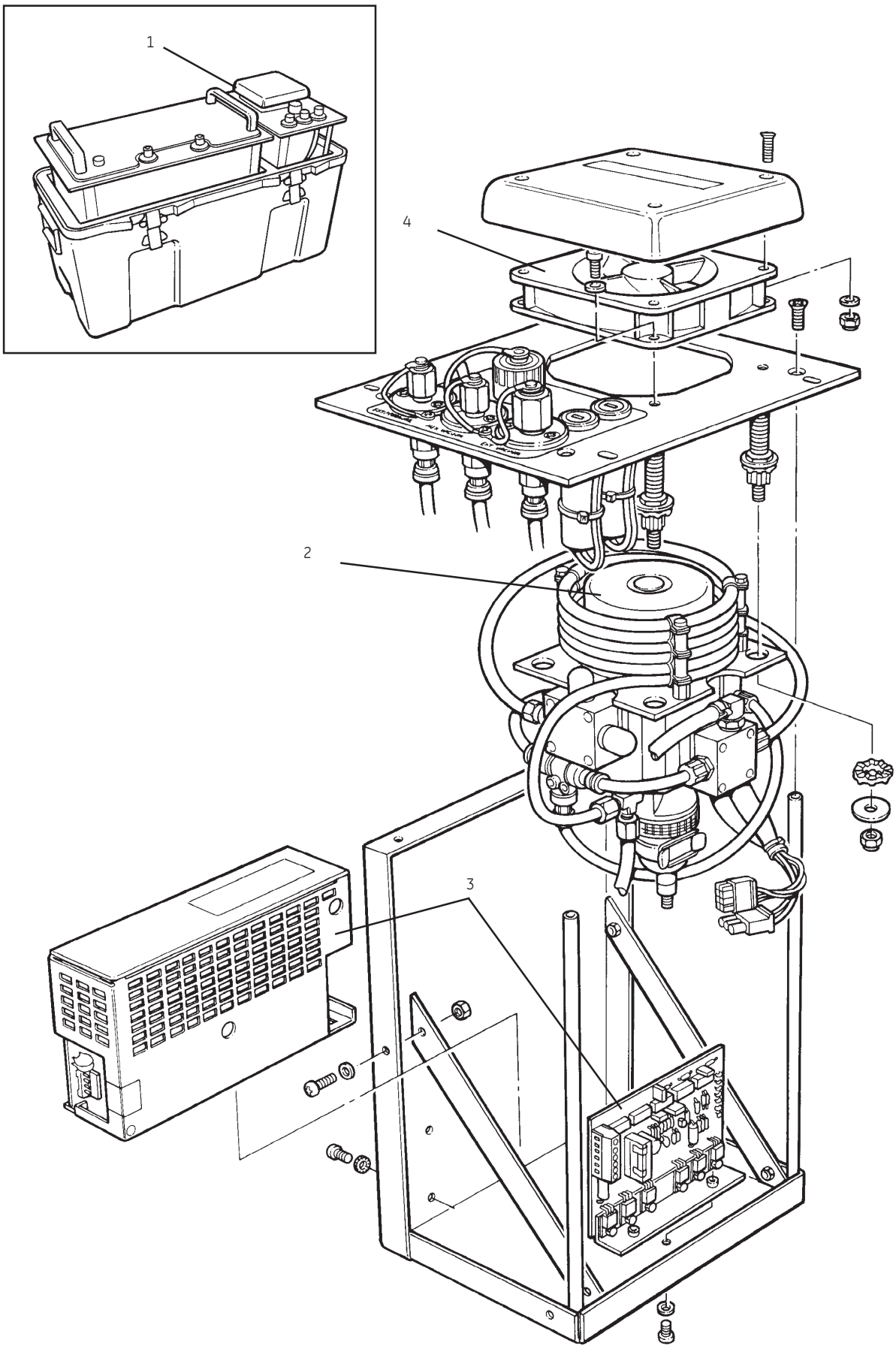


Figure 6-2 ADTS 405F Pump Rack

5 Parts List

Item/ Ref.	Description	Manufacturer's Part Number	QTY
1-1 †	ADTS 405F, Air Data Test System [includes accessories]	-	ref
-2	. ADTS 405F, Air Data Test System	-	ref
-3	. . ADTS 405 Electronics Rack	-	ref
-4 †	. . . Controller/manifold Assembly, 2.6 bar Pitot range	ADTS405-1729-64-M0	1
-4.1 †	. . . .Controller PCB, Ps [matched with item 4.3]	-	NP
-4.2	. . . .Controller PCB, Pt [matched with item 4.3]	-	NP
-4.3	. . . .Manifold assembly	-	NP
	or		
-4A †	. . . Controller/manifold Assembly, 3.5 bar Pitot range	ADTS405-1729-63-M0	1
-4.1A †	. . . .Controller PCB, Ps [matched with item 4.3A]	-	NP
-4.2A †	. . . .Controller PCB, Pt [matched with item 4.3A]	-	NP
-4.3A †	. . . .Manifold assembly	-	NP
-5	. . .Computer PCB	ADTS405-1729-66-M0	1
-6	. . .Power Supply Unit (AC)	ADTS405-1729-71-M0	1
-6A †	. . .Power Supply Unit (AC + DC) [option C] {alternative to item 6}	ADTS405-1729-72-M0	1
-7	. . .IEEE 488 Interface PCB [option E]	ADTS405-1729-69-M0	1
-8 †	. . .PCB, Altimeter Encoder Interface [special order]	ADTS405-1729-89-M0	1
-9 †	. . .PCB, ARINC 429 Interface [special order]	ADTS405-1729-88-M0	1
-10	. . .Panel, Mimic	ADTS405-1729-70-M0	1
-11	. .PCB, Display and Key-pad [part of option B]	ADTS405-1729-80-M0	1
-12	. .Panel, Display and Key-pad [part of option B]	ADTS405-1729-79-M0	1
	* * * * *		

5 Parts List (contd)

Item/ Ref.	Description	Manufacturer's Part Number	QTY
2-1	. .Pump Rack	ADTS405F-1728-62-M0	1
-2	. . .Pump/motor Assembly	ADTS405F-1728-85-M0	1
-3	. . .PSU Motor Controller Assembly (Mod 00) [Superseded by items 3-1A an 3-2A]	-	NP
-3-1A	. . .PSU Pump Universal AC (Mod 01) [Supersedes item 3]	ADTS405F-1728-73-M1	1
-3-2A	. . .Controller Brushless Motor (Mod 01) [Supersedes item 3]	ADTS405F-1728-74-M1	1
-4	. . .Fan	ADTS405F-1728-77-M0	1
	* * * * *		

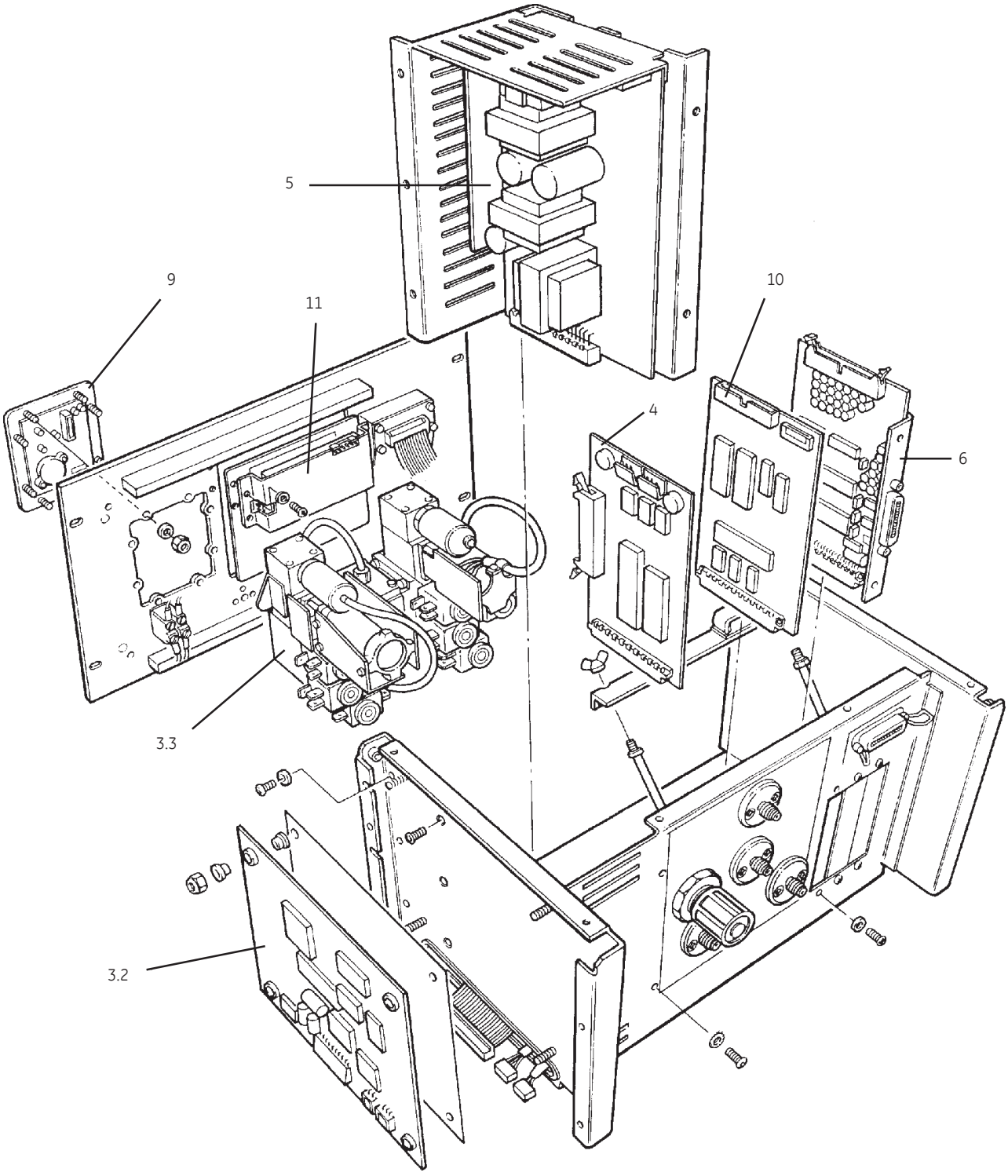


Figure 6-3 ADTS 405

Item/ Ref.	Description	Manufacturer's Part Number	QTY
3-1 †	ADTS 405, Air Data Test System	-	ref
-2 †	. .Terminal, Hand [option A]	ADTS405-1728-40-M0	1
-3 †	. . . Controller/manifold Assembly	ADTS405-1729-65-M0	1
-3.1 †	. . . .Controller PCB, Ps [matched with item 3.3]	-	NP
-3.2	. . . .Controller PCB, Pt [matched with item 3.3]	-	NP
-3.3	. . . .Manifold assembly	-	NP
-4	. . .Computer PCB	ADTS405-1729-66-M0	1
-5	. . .Power Supply Unit (AC)	ADTS405-1729-71-M0	1
-5A †	. . .Power Supply Unit (AC + DC) [option C] {alternative to item 5}	ADTS405-1729-72-M0	1
-6	. . .PCB, IEEE 488 Interface [option E]	ADTS405-1729-69-M0	1
-7 †	. . .PCB, Altimeter Encoder Interface [special order]	ADTS405-1729-89-M0	1
-8 †	. . .PCB, ARINC 429 Interface [special order]	ADTS 405-1729-88-M0	1
-9	. . .Mimic Panel	ADTS405-1729-70-M0	1
-10	. .PCB, Display and Key-pad [matched with item 11]	ADTS405-1729-80-M0	1
-11	. .Panel, Display and Key-pad [matched with item 10]	ADTS405-1729-79-M0	1
-12 †	. .PCB, Motherboard	ADTS405-1729-78-M0	1
-13 †	Kit, Filter, Front Panel	ADTS405-1729-81-M0	1
-14 †	Kit, Filter, Rack rear (AN4+AN6)	ADTS405-1729-82-M0	1
	* * * * *		

List of Accessories

Item/ Ref.	Description	Manufacturer's Part Number	QTY
4-1 †	.Accessory Bag	ADTS405F-1728-39-M0	1
-2 †	.Terminal Hand [see item 3-2]	ADTS405F-1728-40-M0	ref
-3 †	.Cable Assembly 2.5M (6.5ft) [option A] {standard for flight line units}	ADTS405F-1728-41-M0	1
-4 †	.Cable Assembly 15M (50ft) [option A]	ADTS405F-1533-11-M0	1
-5 †	.Cable Assembly 18M (59ft) [option A]	ADTS405F-1728-42-M0	1
-6 †	.Cable Assembly 30M (100ft) [option A]	ADTS405F-1533-12-M0	1
-7 †	.Cable Assembly 46M (150ft) [option A]	ADTS405F-1533-13-M0	1
-8 †	.Cable Assembly, Power 5M (16ft)	ADTS405F-1728-43-M0	1
-9 †	.Kit, Service	ADTS405F-1728-44-M0	1
-10 †	.Hose Assembly, Static 2.5M (8ft)	ADTS405F-1728-50-M0	1
-11 †	.Hose Assembly, Pitot 2.5M (8ft)	ADTS405F-1728-51-M0	1
-12 †	.Kit, Hose Adaptor	ADTS405-1729-52-M0	1
-13 †	Kit, Filter, Pump internal	ADTS405-1729-83-M0	1
-14 †	Kit, Filter, Pump panel	ADTS405-1729-84-M0	1
	* * * * *		

6 Index of Part Numbers

Part Number	Figure and item number	Part Number	Figure and item number
ADTS405F-1533-11-M0	4-4	ADTS405-1729-71-M0	1-6 3-5
ADTS405F-1533-12-M0	4-6	ADTS405-1729-72-M0	1-6A 3-5A
ADTS405F-1533-13-M0	4-7		
ADTS405F-1728-39-M0	4-1	ADTS405-1729-78-M0	3-12
ADTS405F-1728-40-M0	3-2 4-2	ADTS405-1729-79-M0	1-12 3-11
ADTS405F-1728-41-M0	4-3	ADTS405-1729-80-M0	1-11 3-10
ADTS405F-1728-42-M0	4-5	ADTS405-1729-81-M0	3-13
ADTS405F-1728-43-M0	4-8	ADTS405-1729-82-M0	3-14
ADTS405F-1728-44-M0	4-9	ADTS405-1728-83-M0	4-13
ADTS405F-1728-50-M0	4-10	ADTS405-1728-84-M0	4-14
ADTS405F-1728-51-M0	4-11	ADTS405-1729-88-M0	1-9 3-8
ADTS405-1728-62-M0	2-1		
ADTS405-1728-73-M1	2-3-1A	ADTS405-1729-89-M0	1-8 3-7
ADTS405-1728-74-M1	2-3-2A		
ADTS405-1728-77-M0	4-4		
ADTS405F-1728-85-M0	2-2		
ADTS405-1729-29-M0	4-12		
ADTS405-1729-63-M0	1-4A		
ADTS405-1729-64-M0	1-4		
ADTS405-1729-65-M0	3-3		
ADTS405-1729-66-M0	1-5 3-4		
ADTS405-1729-69-M0	1-7 3-6		
ADTS405-1729-70-M0	1-10 3-9		